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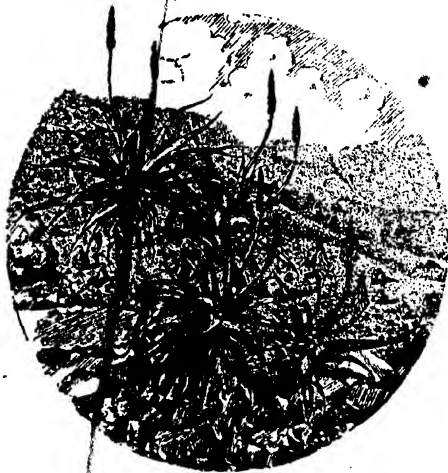
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DESCRIPTIONS OF THE SOUTH AFRICAN PYTHIACEAE WITH RECORDS OF THEIR OCCURRENCE.

By Vincent A. Wager.

INTRODUCTION.

The fungi belonging to the Pythiaceae had received little attention from plant pathologists in South Africa before the writer (25) became interested in this group. Until then, only three species had been recorded, namely, *Phytophthora infestans* on potatoes (late blight), *Ph. parasitica* on rhubarb (crown rot), and *Ph. citrophthora* on citrus (brown rot). During the writer's investigation of root-rot diseases of vegetable and garden plants, Pythiaceae species were encountered more and more frequently, showing that this group of fungi is fairly common, and widely distributed in South Africa. They have been isolated on more than one hundred occasions from forty-four different host plants. They have been isolated from roots and stems of wilting plants, from bark or trunk lesions, from rotting fruits and from many dying and rotting succulent plants. More often than not they were associated with other wilt-producing fungi, more especially species of *Fusarium*, *Rhizoctonia solani*, or *Sclerotium rolfsii*. In large numbers of instances, these latter fungi were probably responsible for the disease in the affected plants, the Pythiaceae being secondary, or living saprophytically in the decaying tissues. Some of them, however, are solely responsible for serious diseases, for instance, *Pythium ultimum* or *P. aphanidermatum* for the foot-rot of papaws (26), and the latter fungus for "leak" disease of potatoes (27). That these fungi have a wide distribution may be shown by the fact that in 1925 the first record of *Ph. citrophthora* was made by Doidge (10) when the fungus appeared in epidemic form causing a brown-rot of oranges in most areas where oranges were grown. Also in 1934 *Ph. parasitica* was recorded by the writer (29) for the first time as a serious disease of tomato fruits, when the trouble occurred in epidemic form over a large area in the eastern Transvaal.

All the Pythiaceae fungi collected have been allotted to 10 known species of *Pythium* and seven known species of *Phytophthora*.* In some cases there are slight differences between these fungi and the original descriptions, but such differences have not been considered sufficiently great to justify making new species.

In the following pages all the fungi mentioned were isolated by the writer unless where otherwise stated, and when localities are not mentioned, they should be understood as meaning the Transvaal.

The writer wishes to thank Mr. S. F. Ashby and his staff at the Imperial Mycological Institute, and Dr. C. M. Tucker of the University of Missouri, for their kind assistance in determining the identity of these organisms. He was also fortunate in meeting Dr. J. T. Middleton at the University of California who is monographing the genus *Pythium*, and is greatly indebted to him for examining the cultures and confirming their identity, and for reading the manuscript. As Dr. Middleton is also including all known records of the host plants and distribution of the species of *Pythium* in his monograph, information on this point is not included in this paper.

For the sake of convenience the words *Pythium* and *Phytophthora* have, in this paper, been abbreviated to *P.* and *Ph.* respectively.

* All the cultures have been lodged in the American Type Culture Collection, Washington, D.C.

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Pythium ultimum Trow.

Hyphae are from 3 to 9 μ in diameter, much branched, and septate in old cultures.

Oogonia are smooth, terminal or rarely intercalar, spherical, or slightly irregular in shape. The diameter ranges from 13.5 to 29.3 μ , the average diameter from different strains being from 18.9 to 23.2 μ .

Oospores are spherical with a smooth, thick wall. The diameter ranges from 11.3 to 23.4 μ , the average diameter from different strains being from 16.0 to 18.9 μ . They germinate after a period of rest, producing one or more germ tubes.

Antheridia are generally one to each oogonium, rarely two; the antheridium has a very short, or practically no stalk; it arises immediately below the oogonium, very rarely from a neighbouring hypha; is more or less horn-shaped, and curves around sharply so that its tip is applied to the oogonium.

Sporangia are mainly terminal and spherical, sometimes intercalar and lemon-shaped; they vary in diameter from 12 to 31 μ , the average diameter in different strains being from 20.6 to 24.2 μ ; they germinate by the production of from one to three germ tubes.

Strains of this fungus isolated from various hosts may differ to a slight extent from one another. In culture media, some produce more aerial mycelium than others; some produce sporangia sparsely and oogonia in abundance, while in others the opposite is the case. There is also some variation in the average size of the oospores, oogonia, and sporangia in the different strains. In all, however, the antheridium is typical and characteristic. The fungus grows well on prune and oatmeal agars. The optimum temperature for the growth varies from 25 to 30°C. in most of the strains, but 35°C. for a few. The maximum temperature is above 37°C. and the minimum is from 4 to 7°C.

The fungus differs very little from that originally described by Trow (22). His average measurements for the oogonia and oospores are 20.6 and 16.3 μ in diameter respectively. A distinctive character of the fungus is the fact that the production of zoospores has never been observed. One difference is that Trow states his fungus to be saprophytic, while here it is parasitic and responsible for numerous diseases.

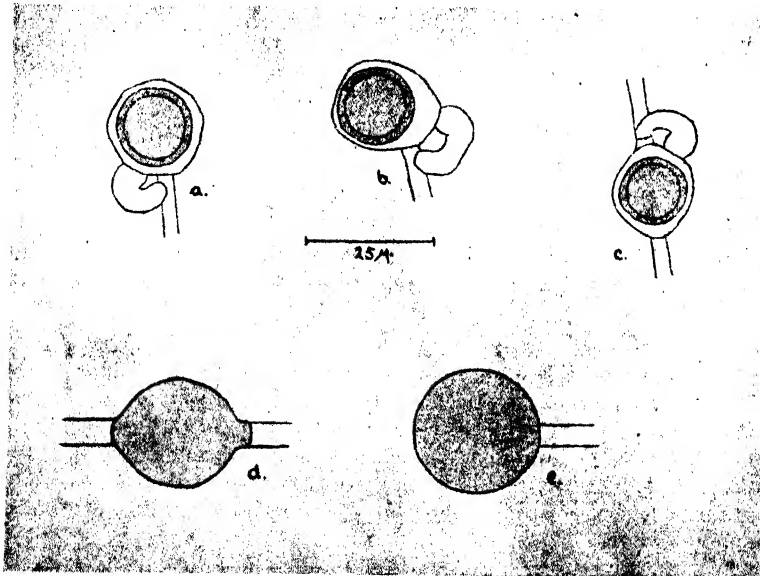


FIG. 1.—*P. ultimum*. (a) and (b) Terminal, and (c) intercalar oogonia and antheridia, (d) intercalar and (e) terminal sporangia.

A culture labelled *P. debaryanum* Hesse was obtained from the Centraalbureau, Holland, and grown in parallel series with a typical culture of *P. ultimum*. The two fungi were found to be similar in all respects, both having the same type of antheridium, and neither producing zoospores when grown in suitable water cultures, including insects. This fungus from Holland was undoubtedly a typical culture of *P. ultimum* and it is quite likely that this same mistake in identity has been made before by other writers. Drechsler (11) also drew attention to this fact and mentioned the difference between the two species.

Hosts.

P. ultimum appears to be the commonest species of the *Pythiaceae* encountered in South Africa and has been isolated from a large number of plants. It may cause a disease of papaws known as "foot-rot", where the base of the trunk becomes soft and rotten, and the plant collapses (26). It has been isolated from this host on 11 occasions from the eastern, northern and western Transvaal, from Natal and the Cape.

It has also been isolated from the following plants, often along with *Rhizoctonia solani* Kuhn, or species of *Fusaria*, and all from the Transvaal except where otherwise stated :

From wilted bean, peanut, tomato, pea (six occasions), tobacco collar-rot and wilt (E. S. Moore), sweet potato infected with soft-rot, rhubarb infected with crown-rot and associated with *Ph. parasitica* from Balfour, Cape, from cabbage infected with soft heart-rot from Port Elizabeth, Cape, and from the navel-end of young Washington navel oranges. From wilted asters (twice), delphiniums (twice), gillias from Natal, nasturtium, pink, sweet peas (four times), witchweed (*Striga lutea*), Iceland poppies (twice) and from damped-off seedlings of Iceland poppy, dahlia, and pine trees.

From the following succulents all infected with a soft-rot, *Dinteranthus microspERMUS*, *Fenesturia aurantiaco*, *Duvalia parvifolia*, *Delosperma* sp., *Stapelia* sp. *Tavaresia* sp., *Aloe variegata* and *Mesembryanthemum* sp.

Hopkins (15) from Rhodesia reports *P. ultimum* on damping-off seedlings of *Clarkia elegans*, *Cupressus* sp., *Coleus* sp., *Pinus* sp., *Carica* papaya, and *Nicotiana tabacum*.

In inoculation experiments *P. ultimum* has been found capable of producing a foot-rot of papaws, soft-rots of potatoes, sweet-potatoes and oranges, and also a rapid wilting of asters when the plants were inoculated through wounds. It caused only the slow wilting and death of a small percentage of Iceland poppies inoculated with it. It is probable that in some cases the fungus is only a weak parasite, but may hasten the wilting when associated with more virulent pathogens, or if the host is weakened through some cultural fault. An interesting case of the longevity of the fungus in the soil was observed. In an experiment, papaws were inoculated with *P. ultimum*, and one plant partially wilted but recovered. It continued growing in the tin in the greenhouse for eight years. At the end of one year a few particles of the soil were removed from the tin and plated, and cultures of *P. ultimum* were obtained. This was repeated after the fifth year, and again after the eighth year, and in each case the fungus was recovered, showing that it was capable of living in the soil without being in the tissue of a plant during this period of time.

Pythium aphanidermatum (Eds.) Fitz.

Hyphae are much branched and non-septate except in fructifications ; vary in diameter from 2 to 10 μ , commonly about 6 μ .

Oogonia are smooth, spherical and terminal, sometimes intercalary ; range in diameter from 18 to 31.5 μ with an average of 25.3 μ .

Oospores are spherical with smooth, thick walls, and do not fill the oogonia ; range in size from 15.8 to 22.5 μ with an average of 21.3 μ in diameter.

Antheridia are sub-orbicular and broadly clavate, being closely appressed to the oogonium ; generally one to each oogonium, sometimes two ; may arise from the oogonial hypha, more usually from another ; may be terminal or intercalary and about 11 μ in size.

Sporangia.—A terminal hypha becomes swollen and usually produces lobulate outgrowths; a septum is formed cutting off this portion which may be up to $150\ \mu$ in length, from the rest of the hypha. Usually from the tip, more rarely from one of the lobulate outgrowths, the vesicle is produced, and may be up to $50\ \mu$ or more in diameter. From 8 to 40 zoospores are produced in the vesicle depending on its size. The zoospores are $9 \times 12\ \mu$ in average size, and are bi-ciliate.

The fungus grows well on prune and oatmeal agars forming profuse white, cottony, aerial mycelium. The optimum temperature for growth is approximately 34°C ., maximum is above 37°C . and no growth takes place at 7°C . The average size, both of the oogonia and oospores, varies only slightly in different cultures from different hosts. The zoospores have been noticed to conjugate, usually in pairs, but as many as 11 have become fused to form a spherical body, which subsequently germinated in a similar manner to a single zoospore. This occurrence does not appear to have been observed by other writers.

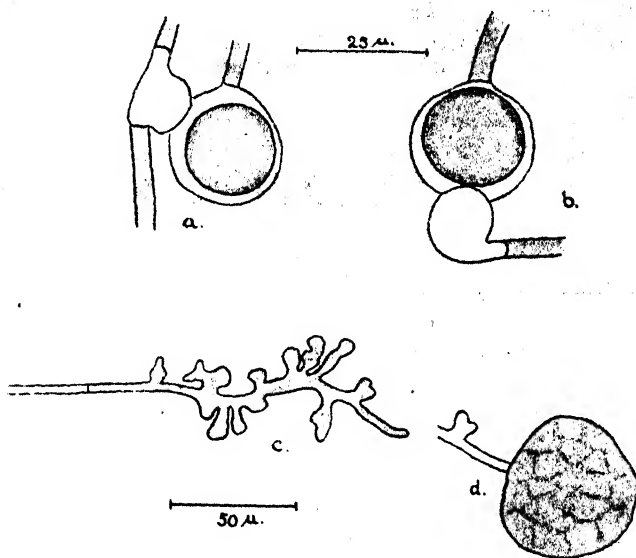


FIG. 2.—*P. aphanidermatum*. (a) Intercalar and (b) terminal antheridium and oogonium, (c) lobulate sporangium, and (d) the vesicle and developing zoospores produced at the tip of (c).

HOSTS.

P. aphanidermatum is responsible for a serious disease of potatoes known as "Soft-rot" or "Leak", which was described in a previous paper (27). It was also found on two occasions to cause a foot-rot disease of papaws in the same manner as does *P. ultimam*. It was isolated from rotting tomato fruits from the northern Transvaal, and from the stems of wilted tomatoes sent from Windhoek, S.W. Africa, and also from wilted squash (*Cucurbita pepo*) from the same locality. It was isolated from the rotting fruits of the chou-chou (*Sechium edule*) and brinjal or egg-plant (twice). It was obtained from damping-off tobacco

seedlings from Balfour, Cape, and from a wilted tobacco plant from the western Transvaal (E. S. Moore). It was isolated from a wilting bracken plant (*Pteridium aquilenum*) and also caused serious destruction in young transplanted tomatoes by rotting away the stems (28).

Hopkins (15) reports it on *Nicotiana tabacum* in Rhodesia.

***Pythium irregulare* Buisman.**

Hyphae are commonly $4.5\ \mu$ in diameter, seldom more but may be less ; much branched, and non-septate except in older cultures.

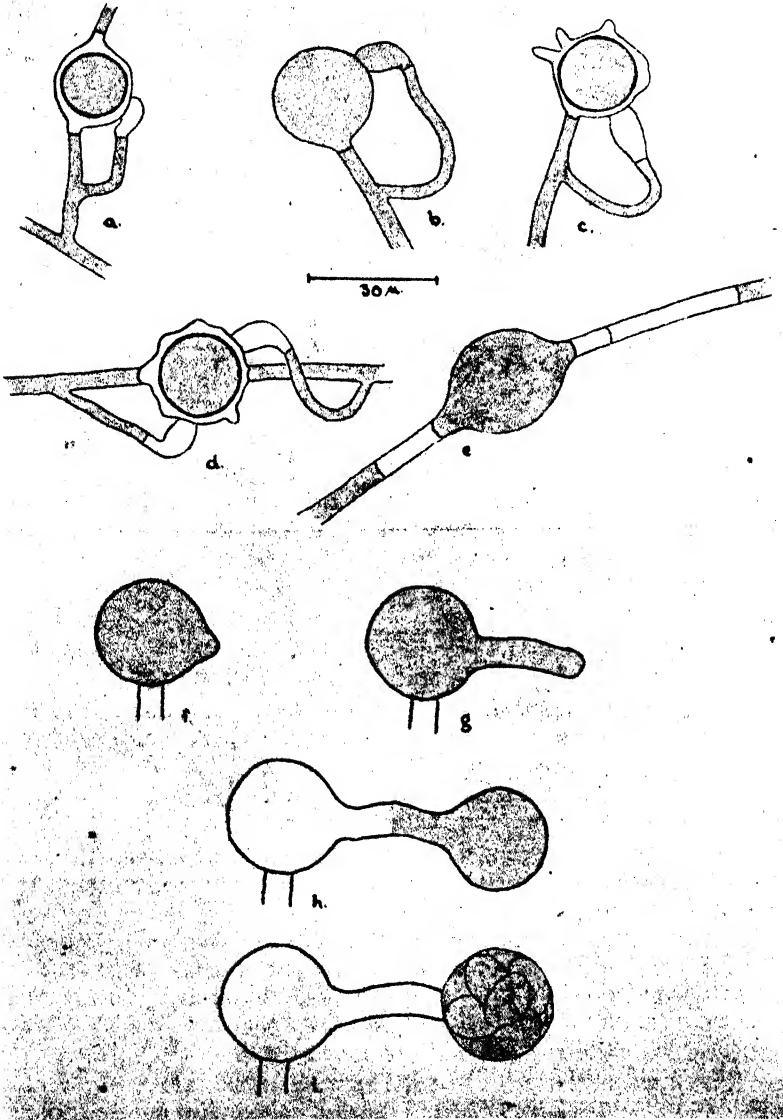


FIG. 3 — *P. irregulare*. (a), (b), (c) and (d) Antheridia and oogonia, (e) an intercalary sporangium, (f), (g), (h) and (i) a terminal sporangium showing stages in the production of zoospores.

Oogonia are mostly intercalary, but sometimes terminal on short lateral branches; may be spherical or irregularly lobed or sometimes with definite narrow processes; vary somewhat in size, but are commonly $22\ \mu$ in diameter.

Oospores are spherical with a smooth, thick wall, not filling the oogonium, 13 to $20\ \mu$ in diameter.

Antheridia are club-shaped to cylindrical, straight or curved; usually one, sometimes two and rarely three to an oogonium; the antheridial stalk is fairly long and usually arises from the same hypha that bears the oogonium.

Sporangia may be terminal or intercalary, more often the latter; they are spherical, or lemon- or barrel-shaped, and from 13 to $28\ \mu$ in diameter. They may germinate by one or more germ tubes, or may produce zoospores. In the latter case, an evacuation tube about $4.5\ \mu$ in diameter, and from 15 to $22.5\ \mu$ in length is produced; the tip of the tube swells out into a vesicle which is spherical and thin-walled.

Zoospores.—From three to nine zoospores have been observed in a vesicle; they are approximately $13.5 \times 9\ \mu$ in size and vigorously motile at first, later becoming spherical, about $10\ \mu$ in size, and germinate, sending out one germ tube.

The fungus grows well on prune and oatmeal agar, and conidia and sexual organs are readily produced in large numbers. The fungus could only be induced with difficulty to form its zoospores. This was accomplished by growing it on sterilised locusts in water incubated at 27°C ., frequent changes of water being made. The optimum temperature for growth was 22°C . for one strain and 28°C . for the other, with maximum 37°C . and minimum 4°C .

The above description agrees fairly closely with that of Buisman (6).

Hosts.

P. irregulare has been isolated from a young papaw plant infected with foot-rot in the northern Transvaal, and from a rotting citrus fruit (E. M. Doidge) from the western Transvaal.

In inoculation experiments it was found that the fungus was unable to produce a rot of citrus fruits when introduced through wounds.

***Pythium vexans* de Bary.**

Hyphae are much branched, most of the branches being very fine, the main branches commonly $4.5\ \mu$ in diameter.

Oogonia are smooth and spherical, often with a widened base, usually terminal, occasionally intercalary; range in size from 15.8 to $22.5\ \mu$ in diameter, with an average (of 50) of $19.4\ \mu$.

Oospores are spherical, with a smooth, thick wall which is generally yellow in colour; range from 13 to $18\ \mu$ in diameter with an average of $16.2\ \mu$.

Antheridium is broad and clasping, about $5\ \mu$ in thickness, and covering about one-third of the surface of the oogonium; may arise from a separate hypha, or from just below the oogonium on the oogonial stalk.

Sporangia are commonly spherical and terminal, but may be pear-shaped and intercalary; vary in size from 13.5 to $22.5\ \mu$ in diameter, with an average of $17.3\ \mu$. They may germinate by producing one germ tube, or may produce zoospores. In the latter case the contents of the sporangium pass through an evacuation tube into a vesicle; the evacuation tube is most commonly about $7\ \mu$ in length and $4.5\ \mu$ in diameter. When the zoospores emerge, the vesicle wall disappears, but the evacuation tube persists.

Zoospores. In different cases under examination, the numbers of zoospores produced were 11, 7, 10, 11, 10. They are elongate and about $11.5 \times 9\ \mu$ in size; they round off to about $9\ \mu$ in diameter, and germinate by one germ tube.

The appearance of the culture on Petri dishes poured with agar is distinctive, the fungus making a fine radial growth, and, as Braun (4) suggests in his description of *P. complectens*, having the appearance of combed silk. Sporangia are produced abundantly on most media, but oogonia are at first very scarce. They may be obtained fairly readily in the aerial fluffy mycelium of a culture on oatmeal agar three to four weeks old. Zoospores were obtained in large numbers when portions of a three-week culture on oatmeal agar were transferred to watchglasses containing Petri's solution, or dilute bean broth, and left in the dark for 15 to 20 minutes. The whole process of zoospore formation is extremely rapid; in one case only 14 minutes elapsed from the moment the vesicle was produced until the zoospores escaped. The temperatures for growth are optimum 28 to 31°C., maximum 37 and minimum 13°C.

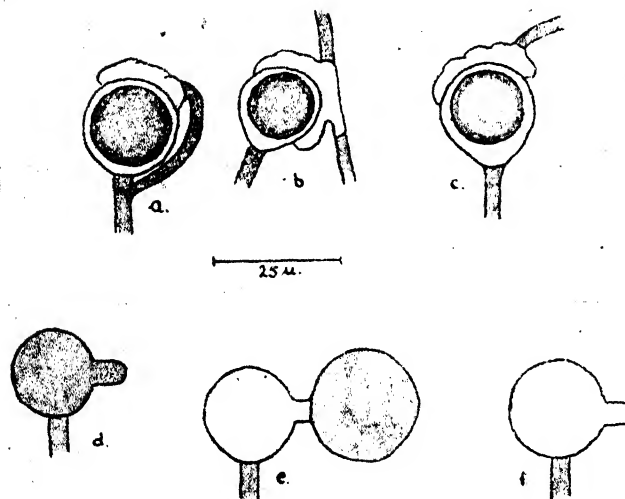


FIG. 4.—*P. vexans*. (a), (b) and (c) Antheridium and oogonium, (d) sporangium and evacuation tube, (e) formation of vesicle, and (f) after the escape of the zoospores.

The above description of the fungus agrees very closely with that of *P. complectens* and *P. vexans*. The sporangia, however, are somewhat smaller, the average diameter being about $4\ \mu$ less than those described for both these species. Middleton (17) suggests dropping the name *P. complectens* in favour of the earlier *P. vexans*, stating that in his opinion the differences between the two species are not sufficiently great to justify the retention of the two species.

Hosts.

P. vexans has been isolated from two different plants; in the first instance, along with *P. aphanidermatum* from a papaw infected with foot-rot, and secondly, along with species of *Fusarium*, from a perennial statice plant infected with wilt or crown-rot.

***Pythium myriotylum* Drechsler.**

Hyphae are much branched, the main branches being up to $9\ \mu$ in diameter; the side branches are variable in thickness, sometimes being thin, 2 to $3\ \mu$, or are swollen out into clavate, lobulate-like processes often in groups and usually in contact with the glass of the culture vessel—the appressoria.

Oogonia are smooth and spherical, usually terminal on short thin branches but may be intercalar; range in size from 22.5 to $28.9\ \mu$, with an average of $25.5\ \mu$ in diameter.

Oospores are smooth and spherical with a thick wall; occasionally two in one oogonium; range in size from 13.5 to $22.5\ \mu$ with an average of $18.5\ \mu$ in diameter.

Antheridia commonly three to six to each oogonium, but may be more; appear like undifferentiated hyphae about $4.5\ \mu$ in thickness; may clasp the oogonium closely or only at the tip; the hypha bearing the antheridium may arise from the oogonial branch, or from a neighbouring hypha; the antheridial branch may divide, producing two or more antheridia.

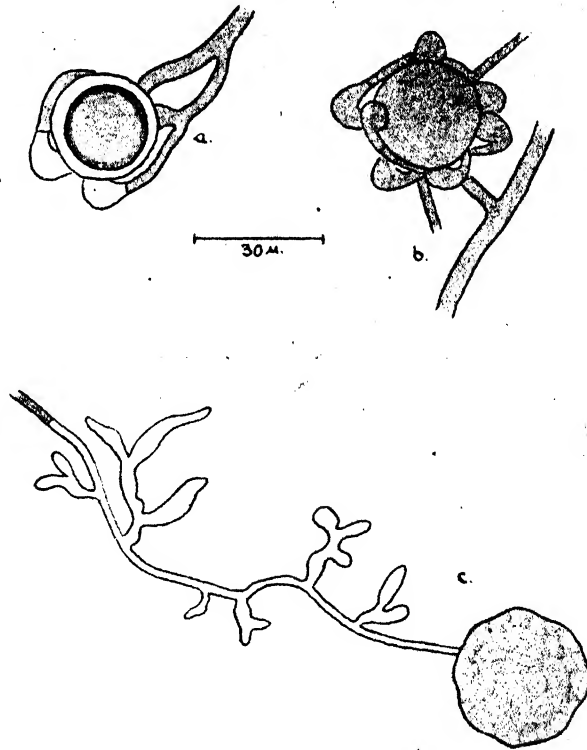


FIG. 5.—*P. myriotylum*. (a) and (b) Oogonia and antheridia, (c) a lobulate sporangium and vesicle.

Sporangia are irregular in shape, usually being formed of the end portion of a hypha with lobulate and rounded outgrowths, very variable in shape and size; the vesicle is produced from one of the lobulate outgrowths, or from the tip of the hypha, and is up to $40\ \mu$ in diameter, depending on the size of the sporangium; up to 40 zoospores are produced in the vesicle.

Zoospores are vigorously motile, 9 to $11\ \mu$ in size before they round off and germinate.

The fungus grows well on various agars, forming abundant aerial mycelium. Oogonia are readily produced on oatmeal agar after three weeks, and sporangia are produced when portions of a culture on plain water agar are placed in Petri's solution and left in the dark for a number of hours. The above description agrees closely with that of Drechsler (12).

The temperatures for growth are optimum 34, maximum about 37, and minimum 7°C.

Hosts.

P. myriotylum has been isolated only once, and that, along with *P. aphanidermatum* and *P. vexans* from papaw plants infected with "foot-rot".

Pythium splendens Braun.

Hyphae are very much branched, the main branches being commonly 6 μ in diameter, but may be as much as 9 μ ; sickle-shaped bodies or appressoria, often in chains, may develop on the medium in contact with the glass.

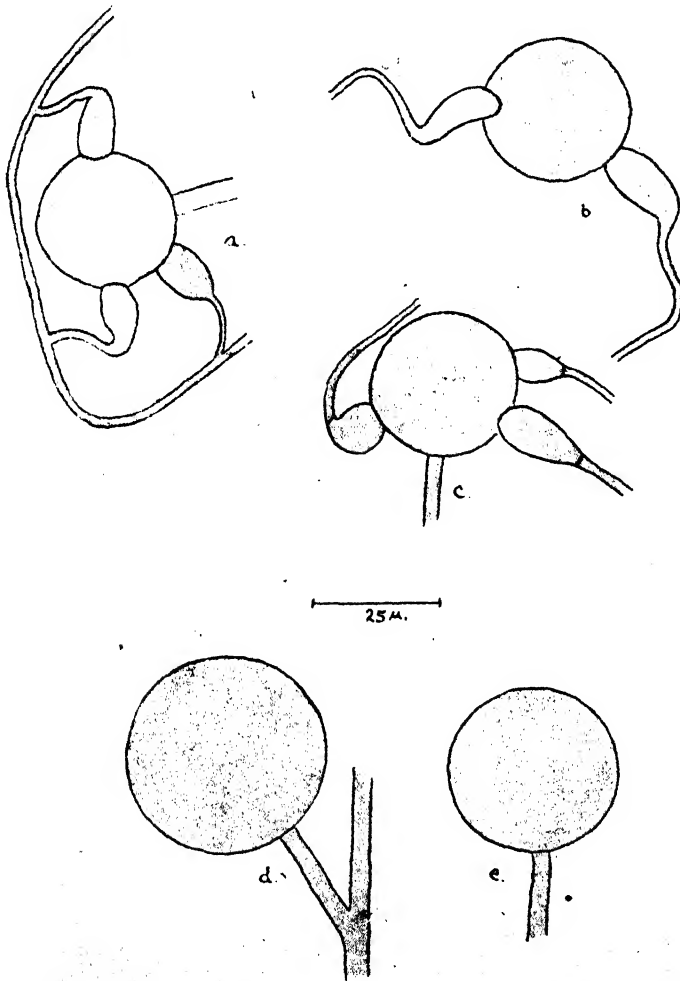


FIG. 6.—*P. splendens*. (a), (b) and (c) Antheridia and oogonia, (d) and (e) sporangia.

Oogonia are smooth, spherical, and terminal; from 27.2 to 35 μ , commonly 33 μ in diameter.

Oospores were not seen by the writer, the contents of the oogonium remaining undifferentiated.

Antheridia one to three to each oogonium, clavate, 8 to 15 μ , usually 10 μ long by 5 to 6 μ wide, the blunt end being applied to the oogonial wall; produced on a hypha adjacent to that producing the oogonium.

Sporangia spherical, smooth, thin-walled, and terminal; vary from 19.8 to 49.5, commonly 33 μ in diameter. Germinate readily producing one or more germ tubes.

The fungus forms profuse aerial mycelium on most culture media. Sporangia are produced after two days and appear in very large numbers. It was some years before the writer was able to obtain any oogonia. They were finally discovered on a potato dextrose culture some three months old, and about a dozen were seen. The contents of the oogonium remained undifferentiated, and oospores were not produced. Braun (5) had a similar difficulty in obtaining oogonia; his figures are, oogonia 25.5 to 34.7, average 31.7 μ in diameter, and oospores, spherical, with thick walls, 21.3 to 29.8, average 26.6 μ ; antheridia were three to eight to each oogonium, and he also stated that the fungus does not produce zoospores. The S. African fungus thus agrees fairly closely with the description by Braun except in the matter of the number of antheridia produced.

Temperatures for growth are optimum 31, maximum 37 and minimum 7°C.

This fungus was mentioned in a previous publication Wager (25) under the name of *P. cf. splendens*.

Hosts.

P. splendens was isolated only once, and that, along with *P. ultimum*, from a papaw tree infected with "foot-rot" from the eastern Transvaal.

Pythium spinosum Sawada.

Hyphae may range from 2 to 8 μ in diameter, much branched, and septate in old cultures.

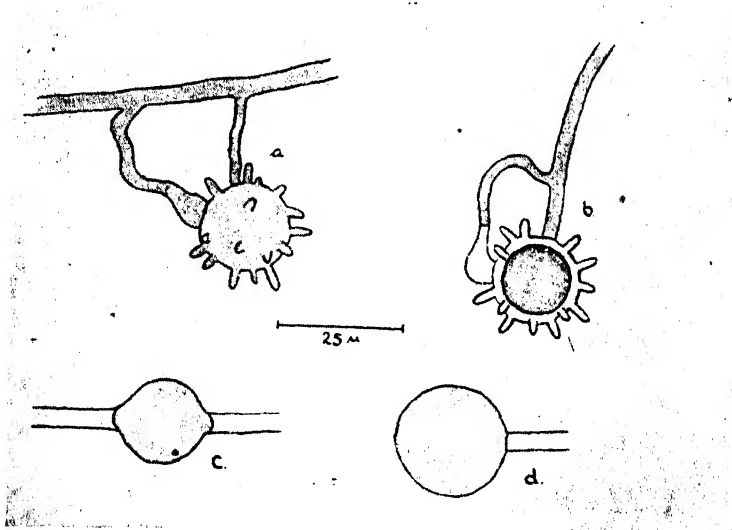


FIG. 7.—*P. spinosum*. (a) and (b) Antheridium and oogonium, (c) intercalar and (d) terminal sporangium.

Oogonia are spherical and covered with spines; they are commonly produced terminally on short lateral branches, but may be intercalary; range from 13.5 to 23.4 μ in diameter, with an average (of 50) of 17.2 μ .

Spines are blunt, narrow, finger-like processes; they are about 4 to 8 μ long by 1.5 μ wide; from 10 to 21 spines being visible laterally on the oogonium.

Oospores are spherical and smooth, and practically fill the oogonial cavity.

Antheridia are usually one to each oogonium, sometimes two or even three; each is borne on a fairly long, slender branch from the same hypha that produced the oogonial branch, or from a neighbouring hypha; it is cut off by a septum from the antheridial branch, and is sub-cylindrical or club-shaped.

Sporangia are produced abundantly in water cultures; they may be terminal and spherical, or intercalary and lemon-shaped or cylindrical; they are smooth but occasionally may have a few spines; they vary greatly in size from 9 to 27 μ in diameter, and germinate, producing one to three germ tubes.

Temperatures for growth are optimum 25 to 28, maximum 37 and minimum 4°C.

This fungus differs from Sawada's description (19, 20) in the fact that multiple antheridia are common whereas he described only single. In correspondence with the writer, E. J. Butler stated that he had examined a culture of *P. spinosum* from the Centraal-bureau, Holland, and found that it also had multiple antheridia, a fact that Sawada had evidently overlooked. In the original description the oogonia are given as ranging from 17 to 24 μ in diameter, with 19.7 μ the average, being thus somewhat larger than those described above. According to the original description this fungus does not produce zoospores, and none has been observed.

Hosts.

P. spinosum has been isolated only once from a young papaw plant infected with foot-rot. The plant had been sent in from a plantation which had just been badly frosted, and as a result nearly all the plants died; the fungus was thus probably not responsible. *P. irregulare* was isolated from an adjacent plant.

Pythium acanthicum Drechsler.

Hyphae are generally very slender, wavy and branched. The mycelium develops successive ridges or scalloped frills as the culture in a tube of oatmeal agar gets old, in a very characteristic manner.

Oogonia are spherical and covered with spines; terminal on short slender branches, occasionally intercalary; vary in size from 18 to 27 μ with an average of 22.3 μ in diameter, exclusive of spines.

Spines are conical with blunt points, slightly longer than broad at the base, and about 2 μ in length.

Oospores are smooth and spherical, nearly filling the oogonium, and thin-walled: vary from 15.8 to 22.5 with an average of 19 μ in diameter; may germinate, producing one or numerous germ tubes, or may develop immediately into a sporangium.

Antheridia are commonly one to each oogonium, sometimes two, rarely three; sub-spherical or clavate, 7 to 10 μ in size, making a broad contact at the tip with the oogonial wall; borne on a short branch usually arising from the same hypha as the oogonium, or from a neighbouring hypha.

Sporangia are smooth, thin-walled, spherical, ovoid, or irregular in shape; terminal or intercalary; range in diameter up to 31.5 , but commonly 22μ ; germinate with the production of numerous, slender germ tubes, or may produce an evacuation tube 30 to 85μ in length, and from 2.5 to 4μ in diameter; the vesicle is produced at the end of the evacuation tube, is spherical and its contents are rapidly divided up into zoospores.

Zoospores. From 8 to 30 zoospores have been observed in a vesicle; they are about $11 \times 7\mu$ in size and vigorously motile at first.

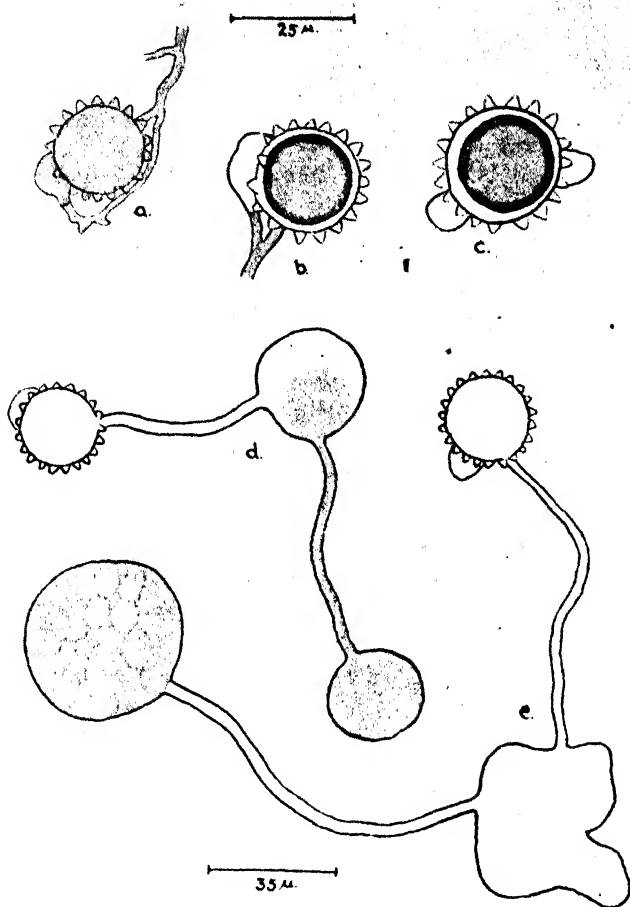


FIG. 8.—*P. acanthicum*. (a), (b) and (c) Antheridia and oogonia, (d) and (e) sporangium, evacuation tube, and vesicle produced directly from the oospore.

■ The fungus grows well on prune or oatmeal agars. Oogonia are produced readily but sporangia are scarce. They were formed when portions of a Petri-dish culture eight weeks old were transferred to Petri's solution. In liquid cultures it was noticed that oospores often germinated, producing a single tube from 10 to 90μ in length, the tip of which swelled out to form a sporangium. This sporangium might be up to twice the size of the oospore, and spherical, ovoid or irregular in shape; it produced an evacuation tube and vesicle in the manner described above. Drechsler (12) mentions this fact in his description of this fungus.

Temperatures for growth are optimum 25, maximum 37, and minimum 10°C.

Hosts.

P. acanthicum has been isolated twice ; from wilted peas, and from damping-off dahlia seedlings. In each case *P. ultimum* was isolated at the same time.

Pythium oligandrum Drechsler.

Hyphae are generally slender, but up to 7 μ in diameter, much branched ; the fungus produces little aerial mycelium on culture media.

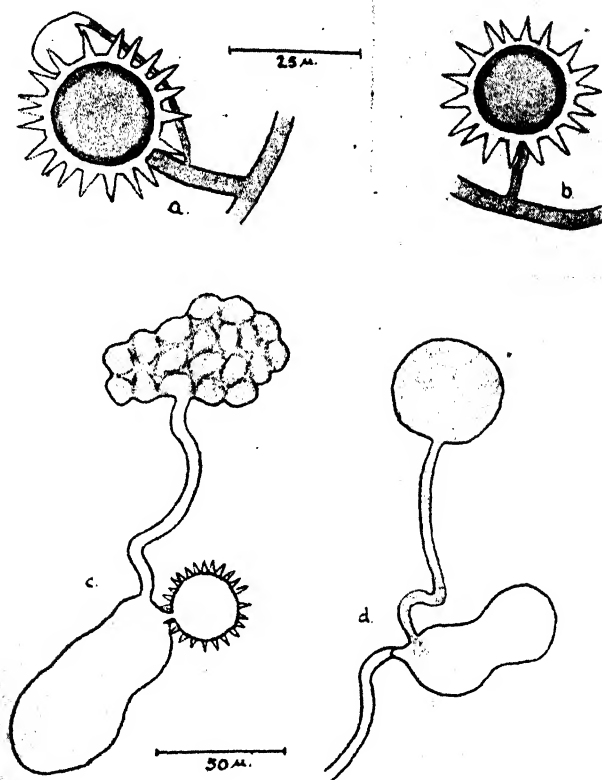


FIG. 9.—*P. oligandrum*. (a) Oogonium and antheridium, (b) parthenogenetic oogonium, (c) sporangium and vesicle produced directly from oospore, and (d) ditto produced in ordinary manner on a hypha.

Oogonia are spherical and covered with spines ; terminal on short slender branches, rarely intercalary ; size exclusive of spines varies from 18 to 27.4 μ in diameter, with an average of 23.4 μ , on oatmeal agar.

Spines are sharp-pointed, conical, about twice as long as broad at the base, vary from 3.4 to 7.7 μ , commonly 5.0 μ in length.

Oospores are smooth, spherical, and thin-walled ; range from 15.8 to $22.5\ \mu$ in diameter, with an average of $20.5\ \mu$ on oatmeal agar ; germinate readily, producing either numerous slender germ tubes or sporangia.

Antheridia are rare ; when present are closely pressed to the oogonium ; are semi-circular or clavate, about $9\ \mu$ wide, borne on a slender branch which arises from the same branch as the oogonium, or a neighbouring one, the branch twining around the oogonium ; usually one, very seldom two to one oogonium ; most oospores appear to develop parthenogenetically.

Sporangia are readily produced on plain water agar ; large, ellipsoid, spherical, elongate or irregular in shape, sometimes with lobulate processes ; usually terminal, but may be intercalar ; range in size up to $90\ \mu$ in length, but commonly about $50\ \mu$; may germinate producing numerous germ tubes, or may form zoospores, in which case the evacuation tube is usually $4.5\ \mu$ thick, wavy, and from 36 to $72\ \mu$ long ; the vesicle is spherical at first, later irregular in shape, and from $27\ \mu$ in diameter to 67.5 by $36\ \mu$; the number of zoospores produced in four cases observed were 5, 5, 6, and 19.

Zoospores vary in size from 12 to $14 \times 9\ \mu$, vigorously motile at first, later become spherical and germinate.

The four cultures obtained behave in the same manner and differ only slightly from each other in their measurements. In two of them, however, antheridia have not been observed, and are rare in the other two ; the oospores appear to develop parthenogenetically. On oatmeal agar, oogonia are produced in profusion, but very few sporangia. On plain water agar, both oogonia and sporangia are numerous. Zoospores are not readily obtained ; they were observed in one case where a portion of a culture on plain agar was placed in Petri's solution for four days, and then transferred to tap water for a few hours. Sometimes the contents of a sporangium pass along the evacuation tube into a vesicle, and no further change takes place. This vesicle may later act as a secondary sporangium and produce another evacuation tube and vesicle in a normal manner.

Temperatures for growth are optimum 25 in one strain and 31 in another, maximum 37 and minimum 10°C .

It was also observed that when placed in water culture, the oogonia germinate and their contents develop immediately into a sporangium which in turn gives rise to an evacuation tube and vesicle as shown in figure 9. This phenomenon is not mentioned by Drechsler (12). The above description of this fungus agrees fairly well with that of Drechsler except that his oogonia are some $3\ \mu$ larger in average diameter.

Hosts.

P. oligandrum has been isolated from shirley poppy, antirrhinum, marrow and cabbage plants, all suffering from wilt. In a previous paper (Wager, 25) this fungus was mentioned under the name of *Pythium* sp. cf. *artotrogus*, as isolated from the first two host plants mentioned above. In inoculation experiments with iceland poppies and asters, the fungus was unable to produce any wilt symptoms. It is probably a weak parasite attacking plants weakened through faulty cultural practices, or plants already wilting due to the attack of some other more virulent pathogen.

Pythium debaryanum Hesse (= *P. fabae* Cheney).

Hyphae are usually slender, up to $6\ \mu$ thick, commonly $3\ \mu$, much branched.

Oogonia are commonly intercalar and sub-globose to lemon-shaped, or terminal and spherical, variable in size from 12 to $25\ \mu$, commonly $16\ \mu$ in diameter.

Oospores are spherical, thick-walled, and practically fill the oogonia.

Antheridia are tubular, making contact at narrowed tip of enlarged apical portion; fairly long antheridial branch which is usually curved or crook-necked; one to three to each oogonium, frequently two, especially on intercalar oogonium when one arises from each side of it; the antheridial branch may arise near the base of the oogonium or some way back along the oogonial branch, or occasionally from a separate hypha.

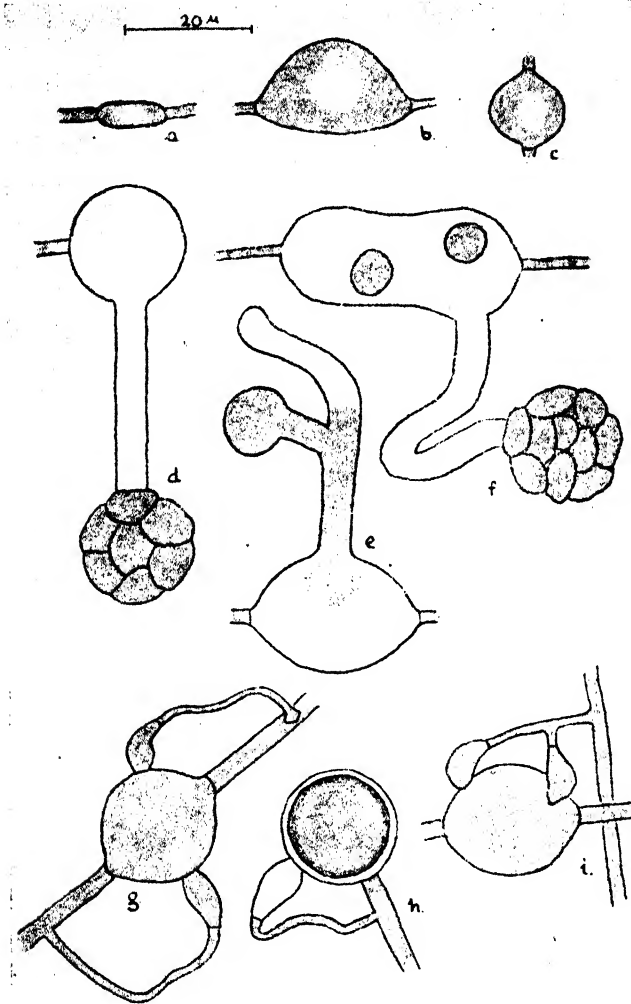


FIG. 10.—*P. debaryanum* (= *P. fabae*). (a), (b) and (c) Variable-shaped intercalar sporangia, (d) terminal sporangium, evacuation tube, vesicle, and developing zoospores, (e) sporangium, old evacuation tube and new evacuation tube and developing vesicle, (f) sporangium and vesicle and zoospores produced in sporangium, (g), (h) and (i) oogonia and antheridia.

Sporangia may be terminal and spherical and from 10 to 30, commonly 21.5μ in size; they are more generally intercalar and irregular in shape, from barrel-shaped, ovoid, elongate or sausage-shaped, and may be very small—like fragments of a hypha—or up to 60×20 , commonly about 20μ in size; all have a large and pronounced vacuole within. They germinate rarely, usually with the production of one germ tube. Zoospores may be

produced in liquid cultures ; the evacuation tube is produced laterally, is thick, and is one to three times the length of the sporangium, commonly $30\ \mu$ long, and is quite commonly curved or bent ; an evacuation tube may be produced but not used, and later another one may be formed or the old one may produce a branch ; the contents of the sporangium pass very rapidly into the forming vesicle ; sometimes not all the contents of the sporangium pass into the vesicle and thus a few spores may develop within the sporangium as well as in the vesicle ; zoospores are 7 to $8\ \mu$ in size, and 12 and 14 were seen produced in various vesicles.

Sporangia are produced in abundance on all media, but oogonia are very scarce, only a few being seen on an old culture. Temperatures for growth are optimum 22 , maximum 28 , minimum 7°C .

In correspondence with the writer, S. F. Ashby suggested that this fungus might possibly be *P. fabae*. Cheney's (8) description of her fungus, *P. fabae*, isolated from wilting broad bean plants, is very similar to the above, although there is no mention of any production of zoospores ; her details are—conidia sparse, 13 to 26 , average $21.5\ \mu$ in size, oogonia 13 to 23 , average $19.7\ \mu$ in diameter. Middleton (17) is of the opinion that the differences between this species and *P. debaryanum* are not sufficient to justify retaining a separate species, and would rather consider it a strain of *P. debaryanum*.

HOSTS.

This fungus has been isolated only once, and that from a succulent (*Stapelia* sp.) that was infected with a soft-rot.

Pythium debaryanum Hesse. (= *P. debaryanum* var. *pelargonii* Braun.)

Hyphae are slender, 3 to 4 but sometimes up to $6.5\ \mu$ in thickness, and much branched.

Oogonia are smooth-walled, spherical when terminal, or somewhat oval when intercalar ; vary in size from 18 to 33 , commonly $21\ \mu$ in diameter.

Oospores are smooth and spherical, and range from 16 to 26 , commonly $19\ \mu$ in diameter.

Antheridia are one to two to each oogonium ; the antheridial branch commonly coils around the oogonium for as much as half its circumference ; the antheridium usually arises from a different hypha from that of the oogonium, but both have been seen on the same.

Sporangia are very variable in size, ranging from 9 to 30.6 , commonly 20 to $23\ \mu$ in diameter, usually terminal and spherical, but often intercalar and oval shaped ; germinate by the production of 1 to 8 germ tubes.

Sporangia are produced in abundance, but only rarely were oogonia seen. Although a variety of culture solutions was tried, and at different temperatures, it was not possible to induce the formation of zoospores.

The temperatures for growth are optimum 25 , maximum 28 and minimum 10°C . Both this fungus and the previous one listed under the name of *P. debaryanum* (= *P. fabae*), after having been kept for a few years in culture tubes, suddenly developed a growth rate of less than half of that which they used to have. They are thus both omitted from Table 1.

The above description agrees very closely with that of *P. debaryanum* var. *pelargonii*. Braun (5) states that oogonia were 17.4 to 21.9, average 20.1 μ in size, antheridia 1 to 4, often adhering to the oogonium along the entire length, sporangia 12.8 to 27.7, average 20.1 μ in size. Sporangia were also produced in abundance, and sexual organs were very scarce. He also states that his fungus is characterised by its minimum growth temperature of 6° C.

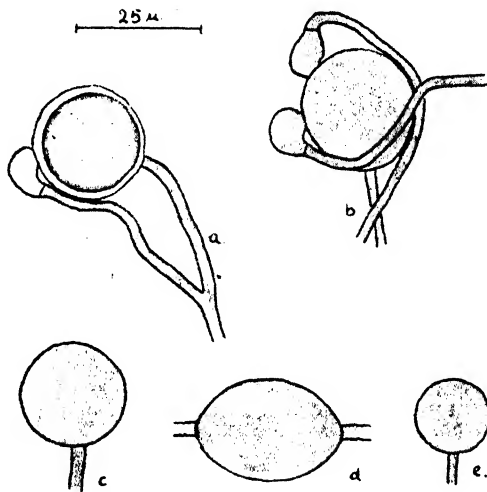


FIG. 11.—*P. debaryanum* (= *P. debaryanum* var. *pelargonii*.) (a) and (b) Oogonia and antheridia, (c) (d) and (e) sporangia.

Middleton (17) suggests that the name *P. debaryanum* var. *pelargonii* should not be retained as he regards this fungus as a minor variant of the somewhat variable species *P. debaryanum*.

Hosts.

This fungus was isolated once only, along with *P. ultimum*, from a wilting bean plant.

TABLE 1.—TEMPERATURE RELATIONS OF THE PYTHIUMS.

Showing the average amount of growth in mm. made by cultures of the various fungi which had been allowed to grow for two days at room temperature, and then placed in the various controlled temperature chambers for a further period of two days.

FUNGUS AND HOST.	DEGREES CENTIGRADE.												
	1	4	7	10	13	16	19	22	25	28	31	34	37
<i>P. ultimum</i> from papaw	0	2	5.5	17	31	42	51	59	67	69.5	64	34	3
<i>P. ultimum</i> from aster	0	0	6.5	19.5	32	42	50	61	70	74	73	48	6
<i>P. ultimum</i> from mesembryanthemum	0	2	7.5	16.5	28	35	46	54	63.5	60	58.5	39.5	5
<i>P. aphanidermatum</i> from papaw.....	0	0	0	3	18	31	45.5	60	77	86	99	99	98
<i>P. aphanidermatum</i> from potato.....	0	0	0	1	7	25	35	45	62	67	82	91	90
<i>P. irregulare</i> from citrus	0	9	13	20	29	36	42.5	50	55	57	47.5	21	2
<i>P. irregulare</i> from papaw.....	0	0	6	9	15	24	29	39	33	31.5	26	15.5	1.5
<i>P. vexans</i> from papaw	0	0	0	0	10	18	24	32	36	37	37	30	3
<i>P. vexans</i> from statice	0	0	0	0	9	18	25	30	36	37	37	30.5	3
<i>P. myriotylum</i> from papaw.....	0	0	1	8	19	31.5	44	54	65.5	71	81	84	83
<i>P. splendens</i> from papaw.....	0	0	1	8	19.5	34.5	41	57	61	61.5	63	42	5
<i>P. spinosum</i> from papaw.....	0	4	11	19.5	29	37.5	43.5	52.5	56	56	42.5	12	3
<i>P. acanthicum</i> from pea	0	0	0	2	11.5	19.5	23.5	30	35	34.5	34.5	28.5	17
<i>P. oligandrum</i> from antirrhinum.....	0	0	0	4	15	25	32	42	51	56.5	47.5	47	25
<i>P. oligandrum</i> from cabbage.....	0	0	0	4	14.5	25	32	44	53	54	59	49	26

Phytophthora infestans de Bary.

Hyphae in plant tissues are 3 to 5 μ in thickness, and much branched. The sporangio-phores are from 200 to 500, or even up to 1000 μ in length, and 5 to 10 μ thick, and often have three or more side branches.

Sporangia are ovoid in shape, and range from 25 to 45 \times 15 to 26, with an average of 30 \times 17.5 μ in size. They readily become detached from the sporangio-phores. Four to eight spores are produced in a sporangium; they are 8 to 10 μ in size, vigorously motile before rounding off and germinating.

Cultures from fresh material were made only with great difficulty. No sexual organs were seen by the writer. Tucker (23) gives the size, as reported by various workers, as oogonia ranging in average size from 27.9 to $38\ \mu$, and oospores 23.6 to $35\ \mu$; antheridia are amphigynous.

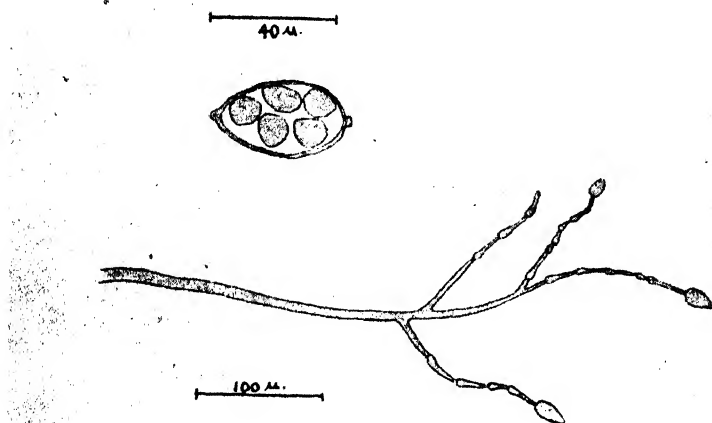


FIG. 12.—*Ph. infestans*. Sporangiophore and sporangia.

Late Blight was first recorded by E. M. Doidge on potatoes in South Africa in 1913. Since then it has occurred sporadically in certain areas of the northern Transvaal, Natal and Cape, when wet seasons occur and the temperature is low. Under such conditions, infection may be severe, and heavy losses result. It was recorded on tomatoes (9) in Natal in 1922.

***Phytophthora parasitica* Dast.**

Hyphae are commonly about $5\ \mu$ in diameter, much branched, and with numerous, short, thin side branches and projections; very much septate in old cultures; large, coiled, lobulate processes are sometimes formed.

Oogonia are spherical and terminal, range from 21.6 to $32\ \mu$, average 24 to $27.7\ \mu$ in diameter in various strains.

Oospores are spherical, thick-walled and yellow to brown in colour in old cultures; range from 17.1 to $29.5\ \mu$, average 21.5 to $24.8\ \mu$ in diameter in various strains.

Antheridia are invariably amphigynous, and commonly $13.5\ \mu$ in size.

Chlamydospores are spherical, terminal; very seldom intercalary, 16.2 to $45\ \mu$, commonly $30\ \mu$ in diameter; thick-walled and yellow-brown in colour in old cultures where they are produced abundantly.

Sporangia are produced on the ordinary mycelium, not on special sporangiophores; terminal, seldom intercalary; normally ovate and prominently papillate; vary greatly in size from 31×27 to 64×46 , in water were commonly $50 \times 38\ \mu$, but the average size

was much less when produced on solid media being about $40 \times 30 \mu$; ratio of length to breadth 1.3 to 1.4; zoospores are produced in the sporangia and escape through the papilla, being 8 to 11 μ in size; germinate usually with one germ tube.

All the isolations mentioned below were grown in parallel series on various culture media. Variations were noted in the form of aerial mycelium produced, rate of growth, development of certain reproductive bodies readily in some and reluctantly in others, size of reproductive bodies, etc., but these variations were considered not of significant difference. Sporangia are produced abundantly, especially in water culture; chlamydospores on solid media and usually in old tubes. The sexual organs are often restricted to a few opaque white patches in which they are abundant. The optimum temperature for growth was 25°C. for the rhubarb strain, and 28°C. for the tomato strain, with a maximum of 37°C. and minimum of 13°C.

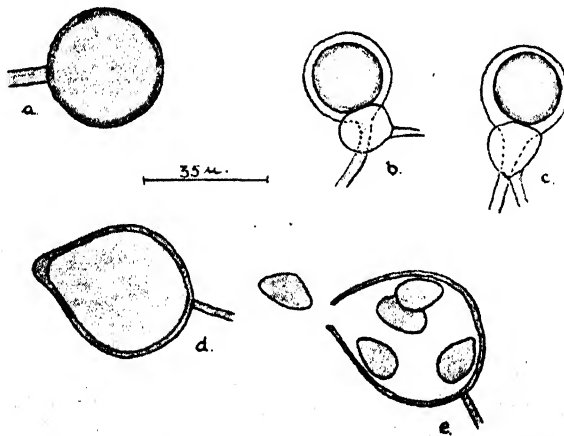


FIG. 13.—*Ph. parasitica*. (a) Thick-walled chlamydospore, (b) and (c) oogonia and amphigynous antheridia, (d) papillate sporangium, (e) sporangium and escaping zoospores.

Hosts.

(a) *Abroad*.—*Ph. parasitica* has a wide host range and world-wide distribution. Tucker (24) has listed the published records of its occurrence, and from this it is seen that the fungus has been found on most vegetable and field crops associated with the wilting of the plants, on the roots and trunk lesions or in rotting fruits of a wide range of fruit and other trees, and in connection with root and stem rots of a large variety of garden, ornamental and greenhouse plants.

(b) *In South Africa*.—Under the name of *Ph. parasitica* var. *rhei*, which Tucker (23) suggests should be eliminated in favour of *Ph. parasitica*, the fungus has been known for many years as the cause of crown-rot of rhubarb. It has recently been isolated from infected rhubarb plants from all areas where this crop is grown in the Cape and Transvaal. Inoculation experiments on rhubarb have shown that the fungus is a virulent parasite.

In 1934 a serious outbreak of brown-rot in tomato fruits occurred in widely-separated localities in the eastern Transvaal, causing considerable damage. The responsible pathogen was identified as *Ph. parasitica* and the trouble was described by Wager (29).

This fungus has been found as the cause of a "purple-rot" of a succulent plant (*Cotyledon* sp.) in which the thick, fleshy leaves successively turned purple and rotten, Wager (25). It was also identified as being the cause of the rotting of another succulent (*Trichocaulon* sp.)

It was isolated (A. M. Bottomley) from a *Delphinium* plant which wilted suddenly.

Hopkins (15) in Rhodesia reports this fungus on *Antirrhinum majus*, *Clarkia elegans*, *Nicotiana tabacum*, *Cotyledon* sp., *Godetia* sp., *Rheum rhaponticum* and *Lilium philippinense*.

***Phytophthora citrophthora* (Sm.) Leon.**

Hyphae are much branched, with numerous irregular-shaped projections; commonly $5\ \mu$ in diameter; may become septate in old cultures; sterile in fruit, but may form sporangia readily in cultures and moist soil.

Oogonia are not known to occur for this fungus.

Sporangia are usually ovate but may sometimes be rounded or irregular in shape; usually one pronounced papilla, sometimes two or three; on oatmeal agar the size ranged from 22.5 to 56.2×20.2 to $40.5\ \mu$ with an average of $40.6 \times 31.3\ \mu$, giving a ratio of length to breadth of 1.3. On plain water agar the average was slightly greater, and the ratio was 1.55. Smith (21) gives the size as 30 to 90×20 to $60\ \mu$ with an average of $50 \times 35\ \mu$, giving a ratio of 1.43. The sporangia produce zoospores, usually about 20, which are discharged through the papilla. They are vigorously motile, become spherical when at rest and commonly $9\ \mu$ in diameter, and germinate by one germ tube.

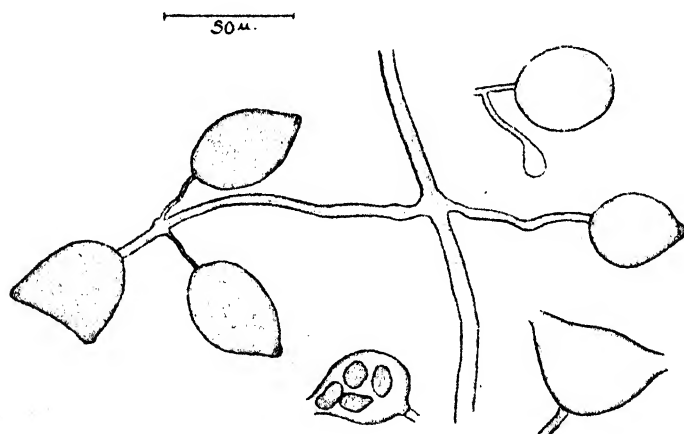


FIG. 14.—*Ph. citrophthora*. Sporangia and zoospores.

The fungus grows well on culture media. It is difficult to isolate from trunk lesions unless very fresh infections are obtained, and the inoculum taken from the junction of discoloured and healthy tissue. The isolations obtained from time to time from infected fruits or bark lesions differed only slightly from one another. The fungus isolated from grapefruit trunk made optimum growth at 25 to 28, while that from orange brown-rot was at 22 to 25, and the maximum and minimum temperatures for growth were 34 and 10°C. respectively.

Hosts.

(a) *Abroad*.—As a disease of citrus the fungus has a world-wide distribution. Tucker (24) records that it has been isolated from bark cankers and trunk lesions, and dying seedlings from walnut varieties, avocado, apricot, sweet cherry, almond, peach, pear, spruce and pine trees. It has also been recorded from watermelon, honey-dew melon, squash and pumpkin.

(b) *South Africa*.—*Ph. citrophthora*, as the brown-rot disease of citrus fruits, first appeared in epidemic form in the western, eastern, and northern Transvaal, and two localities in the Cape, in 1925, being induced by an exceptionally wet season, and caused severe losses, Doidge (10). Since then it has appeared sporadically in the citrus areas during wet periods, especially if weeds are left standing close to the trees, thus reducing ventilation and increasing the humidity. In severe storms, the spores may splash quite high up in the tree and produce infections.

In 1930 the fungus was isolated from a grape-fruit tree infected with gummosis and collar-rot, Wager (25). This trouble occurs frequently in grape-fruit and orange trees in areas where there is a tendency for water-logging of the soil to occur. Experiments in treatment of infected trees by injecting with methylene blue were carried out by Hector and Loest (14).

It has also been recorded by Hopkins (15) and Bates (2) on citrus in Rhodesia.

Phytophthora cactorum (L. & C.) Schroet. (= *Ph. citricola* Sawada).

Hyphae are 4 to 5 μ in thickness, much branched, with numerous, short, side branches or projections.

Oogonia are terminal and spherical, or may have a bulbous or tubular base; vary in size from 18 to 29 μ , with an average of 23 μ in diameter.

Oospores are spherical and practically fill the oogonium; they have a thick, yellow wall.

Antheridia are 6 to 8 μ in size, and paragynous; usually one to each oogonium, rarely two.

Chlamydospores are terminal and spherical and have thin hyaline walls; vary from 14 to 31 μ , commonly 26 μ in size.

Sporangia are ovoid; in some the papilla is inconspicuous, generally it is prominent; range in size from 28.8 to 48 \times 12.8 to 25.6 μ , average 32 \times 19 μ ; are smaller when produced on solid media; may germinate directly with one or more germ tubes, or even forming other sporangia, or may produce zoospores which are actively motile and 8 to 12 μ in size.

The fungus grows well on solid media and oogonia are rapidly produced in abundance. Chlamydospores occur in old cultures. Sporangia are rare on solid media, but develop abundantly in liquid cultures.

The above description is of a fungus isolated from a wilted antirrhinum. *Ph. cactorum* was also isolated in South Africa by Mes (16) from the same host, and by Wijers (30) from carnation, verbena and sweet sultan. Mes gives oogonia ranging from 18 to 28 with an average of 23 μ , and sporangia of 26–88 \times 18–37, commonly 42–49 \times 25–33 μ ; Wijers states that the average diameter of oogonia of her various cultures ranged from 20.7 to 25.3 μ , and gives sporangia considerably smaller than those of Mes. It is evident that there can be a variation of the size of the reproductive organs in different strains of the fungus. Tucker (23) lists a considerable range in the size of oogonia as recorded by various workers, from 24 to 36 μ in diameter, commonly 26 to 28 μ ; and of sporangia as ranging from 15 to 120 μ in length, commonly 50 to 60, and an average for 10 strains of 30 \times 23 μ .

A fungus referable to *Ph. citricola* was isolated by E. M. Doidge from a rotting grape-fruit. Its hyphae do not have so many short side branches or projections as that described above. Its oogonia are consistently some $6\ \mu$ larger, averaging $29.3\ \mu$, with a range of 27.7 to $32.6\ \mu$. Chlamydospores range from 16 to 33 , commonly $28\ \mu$. Sporangia in liquid culture were very irregular in shape, elongated, and prominently papillate, and ranged in size from 42.9 – 72.6×19.8 – $36\ \mu$, with an average of $58.4 \times 30.7\ \mu$. On solid media, sporangia were smaller, ranging from 26 – 49.5×18 – 36 , with an average of $39 \times 28\ \mu$. When grown in parallel series with *Ph. cactorum* from antirrhinum, both show approximately the same rate of growth, and both develop sexual organs rapidly and abundantly. The latter does not produce sporangia so readily as the former. Ashby in correspondence with the writer suggests that, although it does not fully agree with Sawada's isolation, it is a strain of *Ph. citricola*. Tucker (23) however, is of opinion that there are no significant differences between *Ph. citricola* and *Ph. cactorum*, so that the former name should be dropped. This strain from grape-fruit is thus included as *Ph. cactorum*.

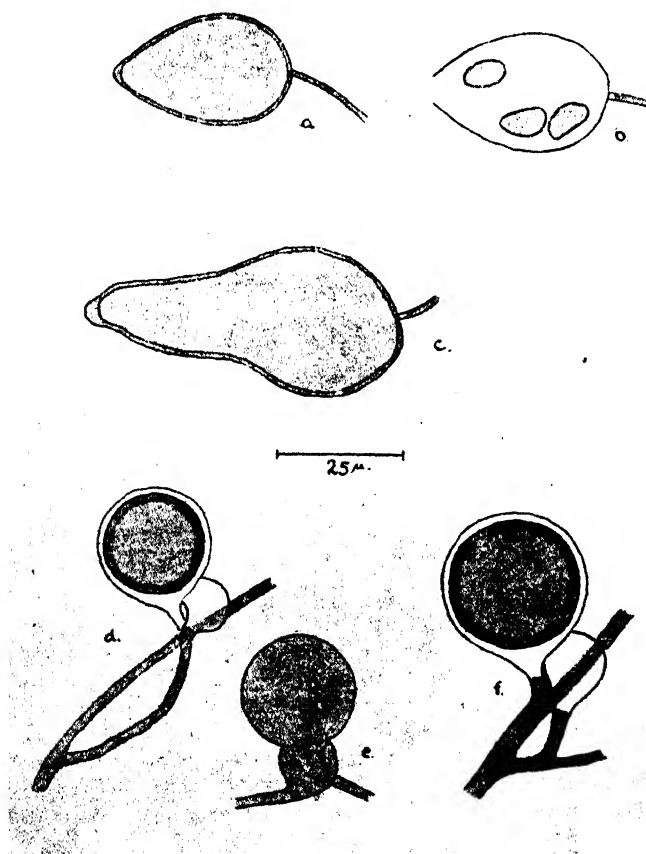


FIG. 15.—*Ph. cactorum* (= *Ph. citricola*.) (a) and (b) Sporangia from antirrhinum strain, (c) ditto from grape-fruit strain, (d) and (e) oogonia and paragynous antheridium from antirrhinum strain, and (f) ditto from grape-fruit strain.

Both cultures were grown in a series of controlled temperature incubators, and the antirrhinum strain gave minimum 4°, optimum 22°, maximum 34°, while the grapefruit fungus gave minimum 7°, optimum 19°, and maximum between 31° and 34°, which agrees with Sawada's findings of maximum of 33°C.

Hosts.

(a) *Abroad*.—From Tucker's (24) list of records of this fungus it is seen that it has a large range of host plants. It has been obtained from stem rots of a large variety of garden and ornamental plants, from vegetable roots and fruits, and from numerous rotting succulents. It has also been obtained frequently from roots and trunk cankers of a large variety of trees, and from wilting seedlings of a number of forest trees. Sawada (20) records his strain (= *Ph. citricola*) on fruits of *Citrus sinensis* var. *Sekkar* and *Citrus tanka* in Formosa.

(b) *South Africa*.—As mentioned above, *Ph. cactorum* was isolated by the writer and Mes from wilting antirrhinum plants, and by Wijers from carnation, verbena and sweet sultan. Doidge isolated a strain of *Ph. cactorum* (= *Ph. citricola*) from a grapefruit affected with a kind of brown-rot from the Cape, and reported that the fungus reproduced the rot when inoculated into grapefruit.

Phytophthora cinnamomi Rands.

Hyphae are up to 10 μ , commonly 6.5 μ in thickness, and much branched; often irregular-shaped protrusions are formed on the hyphae in masses; older hyphae may become brown in colour and septate; the aerial mycelium, especially in older cultures, becomes very tough and wiry.

Oogonia are terminal and spherical, each with a broad, funnel-shaped base within the antheridium, varying in size from 30 to 52, being commonly 42 μ in diameter, (average size of 50 was 41.4 μ); are a brilliant brown in colour.

Oospores are spherical and thick-walled, and fill the oogonia completely.

Antheridia are amphigynous, one to each oogonium, somewhat spherical in shape being about 15 μ in size, or may be oblong and 24 \times 12 μ in size; may be transparent or opaque, and also stained the same brilliant brown colour as the oogonium.

Chlamydospores are spherical, thin-walled, may be borne singly, more usually in groups or bunches of 3 to 12; they range from 26 to 43, commonly 32 μ in diameter.

Sporangia are borne on very thin hyphae; are oval or elongate in shape, and have no papilla; range in size from 39 to 66 by 26 to 40, commonly 50 by 32 μ ; may germinate by one or more germ tubes, and may proliferate, the contents of one sporangium passing up a tube to form another; zoospores may also be produced.

The fungus is characterised by its peculiar irregular or knobby hyphae, the fact that chlamydospores are produced abundantly, usually in grape-like clusters, and by the complete absence of oogonia in ordinary cultures. The fungus was grown for many years on all varieties of culture media without any oogonia ever being produced. They were finally obtained in large numbers in a few oatmeal agar and watermelon-seed agar tubes that were left standing during autumn on a shelf in the laboratory. The oogonia were numerous in some areas on the cultures, especially at the top end of the tube, both in the aerial mycelium and in the agar where it was about $\frac{1}{8}$ -inch thick.

Sporangia were obtained when portions of a culture were placed either in Petri's solution, or soil-extract solution.

The fungus has minimum 10, optimum 25, and maximum 34°C. temperatures for growth.

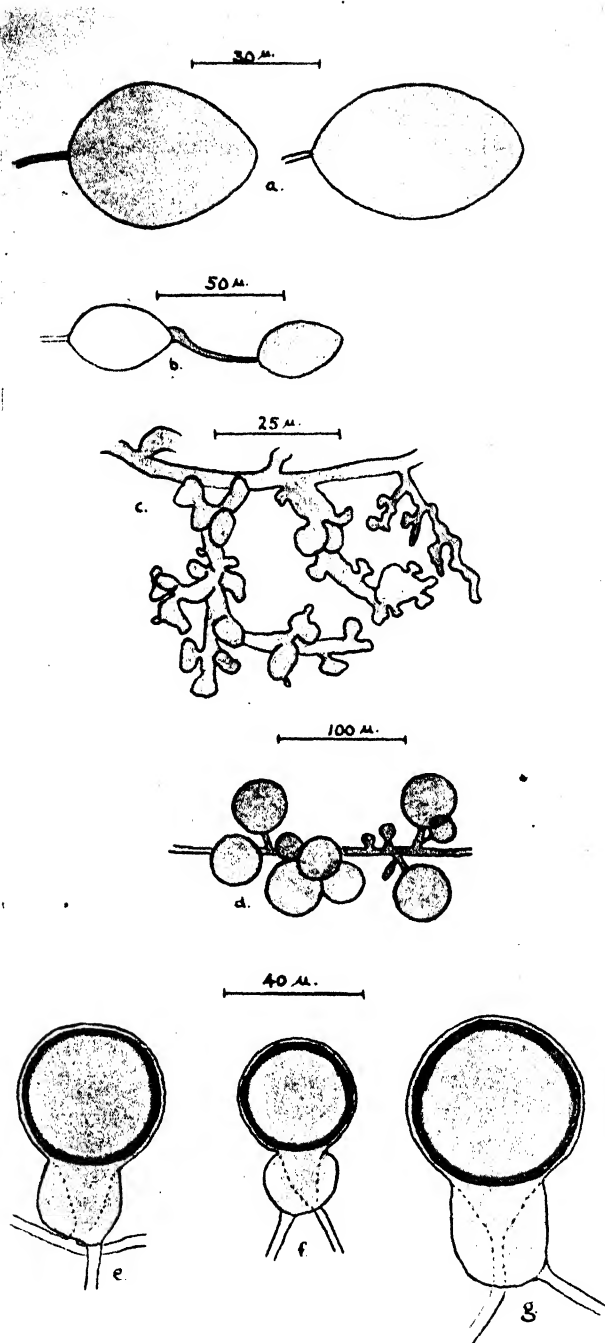


FIG. 16.—*Ph. cinnamomi*. (a) Sporangia, (b) proliferating sporangium, (c) showing the knobby nature of the mycelium, (d) a bunch of chlamydospores, (e), (f) and (g) oogonia and amphigynous antheridia.

Rands (18) in the original description of this fungus gives the chlamydospores as being somewhat larger than those described above, namely 26 to 60, commonly 31 to 50, average $41\ \mu$ in diameter, but sporangia more or less the same as above, being 38 to 84×27 to 39 , average $57 \times 33\ \mu$. He was unable to find oogonia. Ashby (1) obtained oogonia on an old culture of cornmeal agar, average $32\ \mu$ in diameter. Tucker (23) induced the development of oogonia, $28.1\ \mu$ in diameter, when mycelium was placed in M/100 potassium nitrate.

This fungus was mentioned by Wager (25) under the name of *Ph. cambivora* as isolated from rotting roots of the avocado. More recently Ashby is of opinion that the fungus goes better into *Ph. cinnamomi* than *Ph. cambivora*, and Tucker confirms this.

Hosts.

(a) *Abroad*.—From Tucker's list (24), *Ph. cinnamomi* is noted to have been reported from pineapple stems and leaves, erica, rhododendron, and from the bark cankers and rotting roots of numerous species of chestnut, walnut, cinnamon, and on the blackened feeding roots of avocado.

(b) *South Africa*.—*Ph. cinnamomi* has been isolated once only (E. M. Doidge) from decaying avocado roots.*

Phytophthora cryptogea Pethyb. and Laff.

Hyphae are branched, commonly $5\ \mu$ thick; may develop circular or irregular-shaped vesicles, often in groups.

Oogonia are spherical and terminal, with a narrow, funnel-shaped base within the antheridium; vary in size from 24 to $54\ \mu$ in diameter, commonly 40 (average of 50 being $38.4\ \mu$); they are light-brown in colour.

Oospores are spherical and thick-walled, and some 3 to $4\ \mu$ less in diameter than the oogonia.

Antheridia are amphigynous, one to each oogonium, somewhat spherical or oblong in shape, commonly 12 to $15\ \mu$ in size.

Sporangia are usually oval in shape, may be irregular or elongate, and are non-papillate; they range from 22.8 to 68.5 by 16.3 to 35.8 , commonly 35 by $23\ \mu$ in size; the sporangia may germinate directly with the production of a germ tube, or the contents of one may pass out to form another, or a sporangiophore may grow up through the old sporangium; zoospores may be produced, they are large, 13 to $15\ \mu$ in size, and from 3 to 15 are produced in each; they are vigorously motile at first, then round off to about $12\ \mu$ and germinate.

The fungus makes profuse mycelial growth, filling the aerial portion of the Petri dish or tube, and is characterised by the absence of all types of reproductive organs in ordinary cultures.

Sporangia were formed in abundance after six days in Petri's solution, or in non-sterile soil extract. Tucker (23) states that his culture of this fungus produced sporangia 25 to 49 by 16 to 29 , average 36.7 by $21.9\ \mu$ in size.

Oogonia and antheridia were at last found in a tube of oatmeal agar which had been subjected to varying temperatures, such as a few months in an ice-box, then room temperature, the ice-box again, and finally three months on a shelf in the laboratory. *In the

*Foot note.—Since going to press, *Ph. cinnamomi* has been found by the writer on avocado roots both from the western Transvaal and Natal, where the trees were suffering from die-back or decline. Experiments have shown that where excessive water was present, the fungus was rapidly able to kill off the plants.

original description of this fungus, oogonia averaging $30\ \mu$ in diameter were found in an old culture of oatmeal agar. Tucker obtained oogonia averaging $25.8\ \mu$ in diameter in an old oatmeal culture subjected to winter temperatures.

The fungus makes good growth at 4°C ., not below, optimum 22, and good growth up to 34, but none at 37°C .

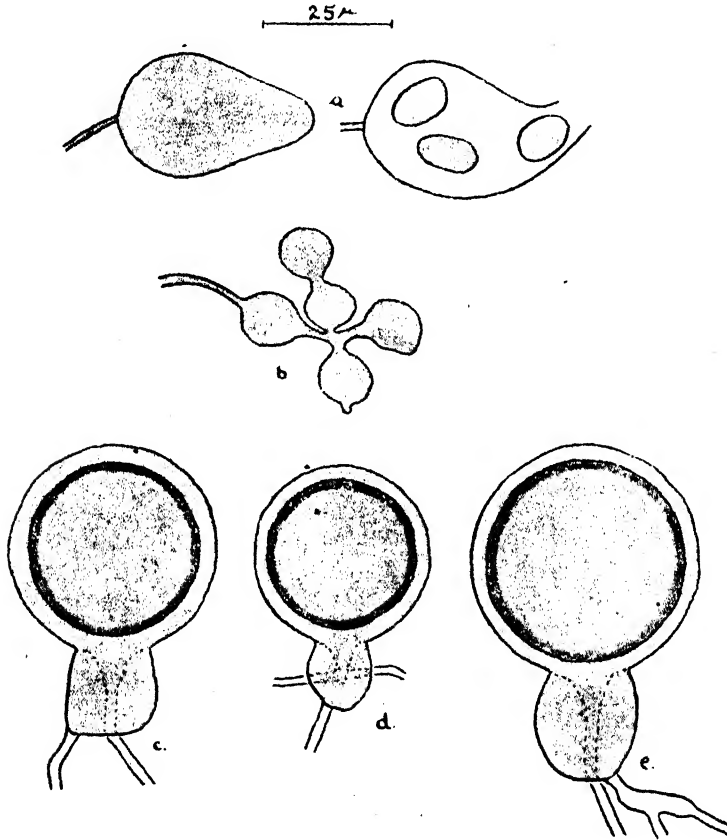


FIG. 17.—*Ph. cryptogea*. (a) Sporangia, (b) irregular-shaped processes occurring on the hyphae, (c), (d) and (e) oogonia and amphigynous antheridia.

Hosts.

(a) *Abroad*.—According to Tucker's list (24), *Ph. cryptogea* is a fairly common parasite in decayed or discoloured roots and stems of garden and ornamental flowers, and of a few vegetables, namely, aster, cineraria, wallflower, lupine, iceland poppy, gilia, antirrhinum, petunia, gladiolus, tulip, turnip, strawberry, tomato and celery.

(b) *South Africa*.—This fungus has been obtained once only (A. M. Bottomley) from a wilting godetia plant.

Phytophthora syringae Kleb (= *Ph. hibernalis* Carne).

Hyphae are much branched, commonly $4.5\ \mu$ in thickness or less, and septate in old cultures.

Oogonia are terminal and spherical; commonly 35.2 , ranging from 26 to $40\ \mu$ in diameter.

Oospores are spherical and almost fill the oogonium; are slightly tinged with a yellow or brown colour.

Antheridia are both amphigynous and paragynous, although the former type predominates.

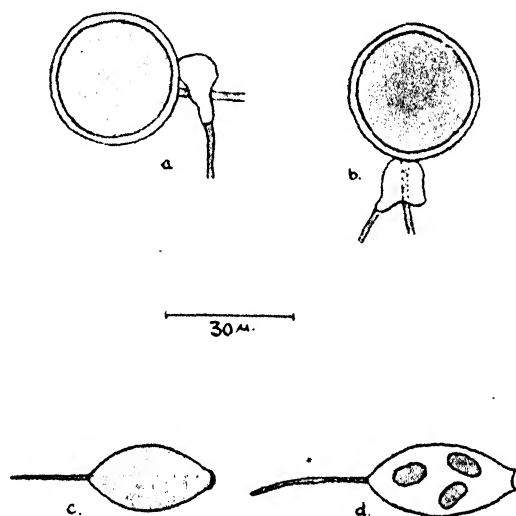


FIG. 18.—*Ph. syringae* (= *Ph. hibernalis*) (a) Paragynous and (b) amphigynous antheridium and oogonium. (c) and (d) sporangia with persistent pedicels.

Sporangia are formed on very slender branches of the mycelium; they are elliptical and vary from 26 to 57 by 15 to 25 , commonly 37.5 by $20\ \mu$ in size. The sporangium has a broad and pronounced papilla; the sporangium readily becomes detached from the mycelium, but retains a portion of the pedicel which may be from 20 to $50\ \mu$ in length, more commonly about the same length as the sporangium; the sporangium may germinate with the production of a germ tube, or zoospores may be formed; these are approximately $10\ \mu$ in length, and after moving vigorously for a time come to rest and germinate.

The fungus grows very slowly on culture media; oogonia are formed readily on most agars, and sporangia were produced on Petri's agar. The optimum temperature for growth was 13 to 16 , minimum 7 and maximum 19°C .

The above description agrees fairly closely with that of *Ph. hibernalis* by Carne (7), except that the oogonia are on the average somewhat smaller. Carne's figures are sporangia average 34.6 by 16.1 , range of 17 to 56 by 10 to $21\ \mu$, and oogonia average 40.8 , ranging from 22.4 to $56\ \mu$ in diameter. Bensaude (3) gives the following figures: sporangia 41 by 19 , range of 25.2 to 54 by 12.6 to 27 (smaller when grown on solid media), oogonia 35.17 , range of 19.8 to $44\ \mu$ in diameter; he also states that the optimum temperature is 18 to 20 , minimum 12 , and maximum 24°C .

Tucker (23) includes *Ph. hibernalis* in the species *Ph. syringae*, but the former name appears to be the one commonly used by citrus pathologists.

HOSTS.

(a) *Abroad*.—*Ph. syringae* has been isolated from common lilac (*Syringa vulgaris*) and and pear and apple fruits in Europe; under the name of *Ph. hibernalis* it has been recorded as a serious fruit-rot, leaf-blight and twig die-back of citrus in Australia, Portugal and California, Tucker (24).

(b) *South Africa*.—This fungus has been isolated only once (Doidge), from oranges showing brown-rot symptoms from the Fish River Valley in the eastern Cape.

TABLE 2.—TEMPERATURE RELATIONS OF THE PHYTOPHTHORAS.

Showing the average amount of growth in mm. made by cultures of the various fungi which had been allowed to grow for four days at room temperature and then placed in the various controlled temperature chambers for a further period of four days.

FUNGUS AND HOST.	DEGREES CENTIGRADE.												
	1	4	7	10	13	16	19	22	25	28	31	34	37
<i>Ph. parasitica</i> from rhubarb crown-rot...	0	0	0	0	5.5	23.5	31.5	40	44	43.5	42	28	6
<i>Ph. parasitica</i> from tomato fruit brown-rot	0	0	0	0	7	13	24.5	26	36	37.5	34	29.5	5
<i>Ph. citrophthora</i> from grapefruit trunk gummosis.....	0	0	0	5	13	20	22	25.5	32	31.5	27.5	2	0
<i>Ph. citrophthora</i> from orange fruit brown- rot.....	0	0	0	5.5	13.5	19	27	29	28.5	25	20	2	0
<i>Ph. cactorum</i> from antirrhinum wilt...	0	2.5	5.5	10	16	23	35	39.5	36.5	35	15	3.5	0
<i>Ph. cactorum</i> from orange fruit rot.....	0	0	4	10	15	22	27.5	26.5	24	23.5	5	1.5	0
<i>Ph. cinnamomi</i> from avocado root rot...	0	0	0	2.5	11	22.5	30.5	38	41	37	22.5	2	0
<i>Ph. cryptogea</i> from Godetia wilt.....	0	3	8.5	13.5	17	23	30.5	39	36.5	35.5	32.5	28.5	1
<i>Ph. syringae</i> from grapefruit brown rot	0	0	4	8	11	11	1	0	0	0	0	0	0

ANNOTATED HOST INDEX.

- Aster** (*Callistephus chinensis* Nees.)
WILT. *P. ultimum*.
- Avocado** (*Persea americana* Mill.)
DECAYED ROOTS. *Ph. cinnamomi*.
- Bean** (*Phaseolus vulgaris* L.)
WILT. *P. ultimum*.
P. debaryanum (= *P. debaryanum* var. *pelargonii*.)
- Bracken** (*Pteridium aquilinum*)
WILT. *P. aphanidermatum*.
- Brinjal** (*Solanum melongena* L. var. *esculentum* Nees.)
FRUIT ROT. *P. aphanidermatum*.
- Cabbage** (*Brassica oleracea* L.)
WILT. *P. oligandrum*.
HEART ROT. *P. ultimum*.
- Carnation** (*Dianthus caryophyllus* L.)
WILT. *Ph. cactorum*.
- Chou-Chou** (*Sechium edule* Sw.)
FRUIT ROT. *P. aphanidermatum*.
- Dahlia** (*D. variabilis* Des.)
DAMPING-OFF. *P. acanthicum*.
P. ultimum.
- Delphinium** (*D. sp.*)
WILT. *P. ultimum*.
Ph. parasitica.
- Gilia** (*G. rubra* Heil.)
WILT. *P. ultimum*.
- Godetia** (*G. sp.*)
WILT. *Ph. cryptogea*.
- Grapefruit** (*Citrus grandis* Os.)
FRUIT ROT. *Ph. cactorum*. (= *Ph. citricola*.)
TRUNK GUMMOSIS. *Ph. citrophthora*.
- Iceland Poppy** (*Papaver nudicaule* L.)
WILT. *P. ultimum*.
DAMPING-OFF. *P. ultimum*.
- Marrow** (*Cucurbita pepo* L.)
WILT. *P. oligandrum*.
- Nasturtium** (*Tropaeolum majus* L.)
WILT. *P. ultimum*.
- Orange** (*Citrus sinensis* Os.)
FRUIT ROT. *P. irregulare*.
Ph. citrophthora.
Ph. syringae (= *Ph. hibernalis*.)
TRUNK GUMMOSIS. *Ph. citrophthora*.
WITHIN NAVEL-END OF YOUNG FRUIT. *P. ultimum*.

Papaw (*Carica papaya* L.)

- FOOT ROT. *P. ultimum*.
P. aphanidermatum.
P. splendens.
P. myriotylum.
P. vexans.
P. irregulare.
P. spinosum.

Pea (*Pisum sativum* L.)

- WILT. *P. ultimum*.
P. acanthicum.

Peanut (*Arachis hypogea* L.)

- WILT. *P. ultimum*.

Pine (*Pinus* sp.)

- DAMPING-OFF. *P. ultimum*.

Pink (*Dianthus plumarius*).

- WILT. *P. ultimum*.

Potato (*Solanum tuberosum* L.)

- LEAF BLIGHT AND TUBER ROT. *Ph. infestans*.
 TUBER SOFT-ROT OR "LEAK". *P. aphanidermatum*.

Rhubarb (*Rheum rhaponticum* L.)

- CROWN ROT. *Ph. parasitica*.
P. ultimum.

Shirley Poppy (*Papaver Rhoeas* L.)

- WILT. *P. oligandrum*.

Snapdragon (*Antirrhinum majus*).

- WILT. *Ph. cactorum*.
P. oligandrum.

Squash (*Cucurbita pepo*).

- WILT. *P. aphanidermatum*.

Statice (*Armeria* sp.)

- WILT. *P. vexans*.

Succulents—producing rots of

- Aloe variegata*. *P. ultimum*.
Cotyledon sp. *Ph. parasitica*.
Delosperma sp. *P. ultimum*.
Dinteranthus microspermus. *P. ultimum*.
Duvalia parvifolia. *P. ultimum*.
Fenesturia aurantiaca. *P. ultimum*.
Mesembryanthemum sp. *P. ultimum*.
Stapelia sp. *P. ultimum*.
P. debaryanum (= *P. fabae*).
Tavaresia sp. *P. ultimum*.
Trichocaulon sp. *Ph. parasitica*.

Sweet Pea (*Lathyrus odoratus* L.)

- WILT. *P. ultimum*.

Sweet Potato (*Ipomoea batatas* Poir.)

- TUBER ROT. *P. ultimum*.

Sweet Sultan (*Centaurea moschata*).WILT. *Ph. cactorum*.**Tobacco** (*Nicotiana tabacum* L.)WILT. *P. ultimum*.*P. aphanidermatum*.DAMPING-OFF. *P. aphanidermatum*.**Tomato** (*Lycopersicum esculentum* Mill.)LEAF BLIGHT. *Ph. infestans*.WILT. *P. aphanidermatum*.*P. ultimum*.WILTING TRANSPLANTS. *P. aphanidermatum*.FRUIT ROT. *Ph. parasitica*.*P. aphanidermatum*.**Verbena** (*V. hybrida* Voss.)WILT. *Ph. cactorum*.**Witchweed** (*Striga lutea*.)WILT. *P. ultimum*.

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NEWLY DESCRIBED SPECIES AND NEW COMBINATIONS.

Chlorophytum longipedunculatum H. Forbes sp. nov. *Affine C. elato sed scapo longiore et robustiore foliis longioribus et latioribus differt.*

Folia viridia, usque 1·36 m. longa et 6·5 cm. lata, lanceolata, prope 50 costis distinctis, glabra, marginibus angustis membranaceis albidis. *Pedunculus* ramosus, usque 1·6 m. longus; bracteae inferiores usque 17 cm. longae ad 3·3 cm. latae, sensim diminutae; superiores 2 cm. longae. *Flores* 4-6-nati in axillis bracteae. *Pediceli* graciles, 1·5 cm. longi, supra medium articulati. *Perianthum* album; segmenta 1·6-1·7 cm. longa, 6-7 mm. lata; 3 exteriora apice extus virida. *Filamenta* 5 mm. longa; antherae 6 mm. longae, lineares, erectae, interlobos basales dorso affixae. *Ovarium* sessile, triquetrum.

TRANSVAAL.

Nelspruit distr.: Sabie, *Pole Evans in Nat. Herb.* 4247 (type). Rustenburg distr.: Rustenburg, *Pole Evans in Nat. Herb.* 10026.

This is a strikingly conspicuous plant when in bloom as its long peduncle bears panicles of pure white starry flowers, only the three outer perianth-lobes being tipped with green. Its nearest affinity appears to be *Chlorophytum elatum* R. Br., but it has a much longer and more robust flowering scape than that species, also its leaves are much longer and broader. The description is based on specimens collected by Dr. I. B. Pole Evans and which flowered at Irene, near Pretoria, in December, 1939.

Two specimens in the Transvaal Museum appear to be very close to this species, namely, *Stewart* (T.M. 9640), collected in Swaziland, and *Obermeyer* 2166, collected on Mt. Silinda, on the outskirts of Chirinda Forest, S. Rhodesia, but in both cases the material is insufficient for a definite determination.

Kalanchoe albiflora H. Forbes sp. nov. *K. thyrsiflorae* Havr. *affinis sed colore et forma floris et inflorescentia differt.*

Herba succulenta, biennis. *Caulis* erectus, crassus, 1-1·5 m. altus, leviter 4- angularis. *Folia* decussata, usque 18 cm. longa et 15 cm. lata (juniora gradatim reducta), supra leviter concava, infra leviter convexa, basi connata et decurrentia, glaberrima; seniores marginibus distincte rubris. *Inflorescentia* paniculata, multiflora. *Pedunculus* simplex vel semel vel bis dimidiatus. *Bracteae* alternae; inferiores usque 7 mm. longae et 2·5 mm. latae, ovatae, sensim diminutae. *Flores* in scorpiodi-cymis. *Pedicellus* usque 1 cm. longus. *Calyx* 4 mm. longus, 2·5 mm. latus; lobi ovato-obtusi. *Corolla* 1·2 cm. longa, 8 mm. lata, urceolata, leviter 4- angularis; lobi albi, 5-6 mm. longi, 2·5-3 mm. lati, ovati, obtusi. *Stamina* 8, biseriata, ad medium corollae inserta; filamenta applanata, 5-6 mm. longa. *Carpella* 4, 1·15 cm. longa; stylus simplex. *Squamae* 1·5 mm. longae, 2 mm. latae. *Semina* parva, fusca.

ZULULAND.

Uumbo, *Gerstner in Nat. Herb. Pretoria*, 26434, (type) and *Natal Herb. Durban*.

Natal:—Ngotshe distr.: Mooiklip near Louwsberg, *Verdoorn* 1696, 1720.

TRANSVAAL.

Barberton distr.: Rocky ridges, Barberton, *Galpin* 1353. Lydenburg distr.: Suku-kunie, *Barnard* 328.

A tall handsome plant very similar in appearance to *K. thyrsiflora* Harv. from which it differs in the scorpioid cymose inflorescence and pure white or creamery white urceolate corolla. The whole plant is covered with a white powdery bloom, often less dense on the lower leaves.

Galpinia paviflora H. Forbes sp. nov. *affinis G. transvaalica* N.E. Br. *paniculo laxiore floribus minoribus foliis differt.*

Arbor parva, ramulis tetragonis. *Folia* supra viridia, infra pallidiora, breviter petiolata, 2.5–8.5 cm. longa, 1–3 cm. lata, oblonga vel obovata vel elliptico-obovata, obtusa, apice recurva, costa subtus infra apicem glandulifera, basi cuneata vel cuneato-rotundata. *Paniculae* terminales et axillares, multiflorae, bracteae foliiformae, 0.5–1.5 cm. longae, 0.1–1.4 cm. latae, majores foliis similes. *Pediceli* tetragoni, 2 mm. longi. *Calycis* tubus campanulatus, 5–6-dentatus, persistens; dentibus triangularibus acutis apicem versus breviter ciliatis, sinubus dentatis. *Petala* 5–6, fauci calycis inserta, lanceolata, 2–3 mm. longa, 1 mm. lata. *Stamina* 5–6, 4 mm. longa, infra medium tubi calycis inserta, filamentis exsertis, antherae didymae. *Ovarium* sessile, imperfecte 2-loculare, apud 1 mm. longum et latum; stylus 3mm. longus, filiformis.

ZULULAND.

Hluhluwe Game Reserve. Gerstner 3182, in *Nat. Herb. Pretoria and Natal Herb. Durban* (type).

In Kew Bulletin 1894, p. 345, N. E. Brown described a new genus, *Galpinia*, which he named in honour of Dr. E. E. Galpin who collected the type material. For many years only the one species, *G. transvaalica* N.E.Br. was known, then a second species, described here, was collected in Zululand by the Rev. Father J. Gertsner. This species is distinguished from *G. transvaalica* by its looser panicle, smaller flowers and by its leaves, which are not so thick or opaque as those of *G. transvaalica*. The native name for this tree is „umPisama-kasa” and Father Gerstner states that “the leaves are liked by the black rhino”.

Stachys villosissima H. Forbes sp. nov. *Affinis S. Galpini* Briq., *inflorescentia laxiore et calycis laciniis longioribus et acutoribus differt.*

Herba villosissima, basi ramosa, ramis decumbentibus vel ascendentibus, simplicibus vel interdum ramulosis. *Folia* subsessilia vel breviter petiolata, 0.6–2 cm. longa, 0.7–1.8 cm. lata, ovata vel ovato-cordata, marginibus dentatis, villosissima. *Inflorescentia* laxa, verticillastri 2-flori. *Bractae* inferiores foliis similes; superiores maxime reductae, lanceolatae, dense villosae. *Flores* brevissime pedicellati. *Calyx* 7–9 mm. longus, 6–8 mm. latus; tubus campanulatus, 10-nervatus, dense villosus; lacinae 2.5–3 mm. longae, lanceolatae, acutae, setaceae. *Corollae* tubus cylindraceus, 6 mm. longus; limbus 2-labiatus, labio postico erecto, ovato, 3 mm. longo, antico patente 3-fido, lobo medio maximo, 3 mm. longo. *Stamina* 4, didynama. *Stylus* apice 2-fidus, 8 mm. longus. *Nuculae* parvae, fuscae.

ZULULAND.

Eshowe, Forbes, 722 in *Natal Herbarium, Durban*; Entumeni: Forbes 783 (type) in *Natal Herbarium, Durban* and *National Herbarium, Pretoria*.

A small plant generally growing among grass. All parts, except the flowers, are densely villous. The flowers are white or very pale lilac and are arranged in lax 2-flowered verticels.

Brachystelma Dinteri (Schltr.) Phill. comb. nov.

(*Blepharanthera Dinteri* Schltr.).

Brachystelma Inandensis Phill. comb. nov.

(*Aulostephanus natalensis* Schltr.).



Kalanchoe albiflora H. Forbes.

Caralluma Winkleriana (Dinter) Phill. comb. nov.
 (*Saracophagophilus Winklerianus* Dinter).

Tenaris Schultzei (Schltr.) Phill. comb. nov.
 (*Kinepetalum Schultzei* Schltr.)

Ruellia velutina (C.B.Cl.) Phill. comb. nov.
 (*Dinteracanthus velutinus* C.B.Cl.)

Ruellia asper (C.B.Cl.) Phill. comb. nov.
 (*Dinteracanthus asper* C.B.Cl.)

Ruellia Marlothii Engl.
 [*Dinteracanthus Marlothii* (Engl.) C.B.Cl.]

Felicia australis (Alston) Phill. comb. nov.
 (*Pseudotrichia australis* Alston.)

A NOTE ON N. E. BROWN'S SUB-DIVISION OF THE GENUS *ANTHOLYZA* LINN.

By E. P. Phillips.

In the Transactions of the Royal Society of South Africa [vol. 20, p. 265 (1932)], Dr. N. E. Brown contributed an interesting paper on the genus *Antholyza* Linn. He pointed out the confusion that had resulted from a wrong conception of Linne's genus, and that many very different plants had been placed in this genus that could not legitimately find a home there. In place of the one commonly recognised genus, Brown proposed nine separate genera for all the species hitherto included in the genus *Antholyza*. Two of his nine genera are genera proposed by Salisbury over one hundred years ago; six genera are described by Brown for the first time; the ninth genus being *Antholyza* Linn.

In looking through the specimens in the National Herbarium named by Dr. Brown, the writer considers that Brown has succeeded in clearing up much of the prevailing confusion though he has gone too far in proposing so many genera. In the writer's opinion the genera *Pentamenes* Salisb., *Kentrosiphon* N.E.Br., *Chasmanthe* N.E. Br., and *Anomalesia* N.E. Br., should be grouped together under the oldest name *Pentamenes* Salisb. All these genera are characterised by the elongated upper perianth-lobe which is differently shaped to the other five lobes and are concave or hooded. This appears to be a very natural grouping but the subsidiary characters used by Brown to separate the genera e.g., the saccate perianth-tube of *Kentrosiphon*, the reflexed perianth-lobes of *Anomalesia*, and the slight differences he gives between *Pentamenes* and *Chasmanthe* do not warrant generic status.

The genera as now proposed may be keyed out as follows:—

1. Stem bearing one dense sessile lateral spike near its base and continued beyond it as a naked stem with some barren bracts or with one flower at its apex *Antholyza* Linn.
Stem simple or branched, with the stem or branches ending in a lax or dense spike of flowers 2
2. Stem branched so that whole inflorescence is a panicle of spikes *Curtonus* N.E. Br.
Stem simple or branched, but whole inflorescence not paniculately arranged 3
3. Stem with 2-4 dense sessile lateral spikes and one terminal spike *Anaclanthe* N.E.Br.
Stem usually unbranched, sometimes branched in *Pentamenes* 4
4. Upper lobe of flower much longer than the other five, differently shaped and concave or hooded, with the stamens under the hood and about equalling or exceeding it *Pentamenes* Salisb.
All lobes of the flower either sub-equal and similar in form and flat, or unequal with the five lower lobes gradually smaller but all similar in form and the upper not hooded 5
5. Flower-spike dense, 10-30-flowered; bracts hard, rigid, with the inner longer than the outer *Anapalina* N.E.Br.
Flower-spike lax, 1-7-flowered; bracts herbaceous, with the outer longer than the inner, *Homoglossum* Salisb.

PETAMENES Salisb. ex N.E. Br. emend.

(*Kentrosiphon* N.E.Br. ; *Chasmanthe* N.E.Br. ; *Anomalesia* N.E.Br.)

Perianth-tube curved, contracted below into a slender basal part, with or without a short spur or sac ; lobes unequal ; upper lobe much longer than the other five, spatulate, concave or hooded. *Stamens* nearly as long as and seated under the upper lobe, arising from the same or different levels on the perianth-tube. *Capsule* ellipsoid, shorter than the bracts, sometimes angular and winged. *Seeds* many, flat, broadly winged.

Corm small, globose or sub-globose, sometimes producing stolons that end in a corm ; leaves basal or cauline, linear or ensiform ; stem simple or branched ; spikes solitary or sometimes up to four ; flowers 3–25 in spike ; bracts firm or somewhat herbaceous, equal or unequal.

An African genus of 23 species ; 16 species occur in South Africa extending from South West Africa through the coastal belt to the Kentani district.

(Type :—*P. abbreviatus* N.E.Br. = *Antholyza quadrangularis* Bkr. non Burm.)

The above rearrangement of the genera necessitates certain name changes which are given below :—

- Petamenes cunonia** (L.) Phill. = *Antholyza cunonia* L.
= *Anomalesia cunonia* (L.) N.E.Br.
- P. splendens** (Sweet) Phill. = *Anisanthus splendens* Sweet
= *Anomalesia splendens* (Sweet) N.E.Br.
- P. saccatus** (Klatt) Phill. = *Anisanthus saccatus* Klatt
= *Kentrosiphon saccatus* (Klatt) N.E.Br.
- P. Steingroveri** (Pax) Phill. = *Antholyza Steingroveri* Pax
= *Kentrosiphon Steingroveri* (Pax) N.E.Br.
- P. propinquus** (N.E.Br.) Phill. = *Kentrosiphon propinquus* N.E.Br.
- P. gracilis** (N.E.Br.) Phill. = *Kentrosiphon gracilis* N.E.Br.
- P. Duftii** (Schinz) Phill. = *Antholyza Duftii* Schinz
= *Kentrosiphon Duftii* (Schinz) N.E.Br.
- P. caffra** (Bkr.) Phill. = *Antholyza caffra* Bkr. non Ker
= *Chasmanthe caffra* (Bkr.) N.E. Br.
- P. bicolor** (Gasp.) Phill. = *Antholyza bicolor* Gasp.
= *Chasmanthe bicolor* (Gasp.) N.R.Br.
- P. intermedia** (Bkr.) Phill. = *Antholyza intermedia* Bkr.
= *Chasmanthe intermedia* (Bkr.) N.E.Br.
- P. aethiopica** (L.) Phill. = *Antholyza aethiopica* L.
= *Chasmanthe aethiopica* (L.) N.E.Br.
- P. Peglerae** (N.E.Br.) Phill. = *Chasmanthe Peglerae* N.E.Br.
- P. floribunda** (Salisb.) Phill. = *Antholyza floribunda* Salisb.
= *Chasmanthe floribunda* (Salisb.) N.E.Br.
- P. fucata** (Herb.) Phill. = *Tritonia fucata* Herb.
= *Chasmanthe fucata* (Herb.) N.E.Br.
- P. vittigera** (Salisb.) Phill. = *Antholyza vittigera* Salisb.
= *Chasmanthe vittigera* (Salisb.) N.E.Br.
- P. spectabilis** (Schinz) Phill. = *Antholyza spectabilis* Schinz
= *Chasmanthe spectabilis* (Schinz) N.E.Br.

The plant named *Petamenes Guthriei* by N. E. Brown is a species of *Homoglossum* and the new combination is **Homoglossum Guthriei** (Bolus) Phill.

JOSEPH BURTT DAVY.

By M. D. Gunn.

Joseph Burtt Davy, M.A. (Oxon.), Dr. Phil. (Oxon.), Ph.D. (Cantab.), F.R.G.S., F.L.S., whose death occurred at Oxford on the 20th August, 1940, was born on the 17th March, 1870, at Findern in Derbyshire. His name will always be associated with the foundation of the Transvaal Colonial Herbarium that has since developed into the present National Herbarium.

During the year 1891-92 Burtt Davy was an assistant in the office of the Director of the Royal Botanic Gardens, Kew, but resigned owing to ill-health and went to California. He worked at Berkeley University as a research student and held various botanical posts. For a short period he was assistant curator in the U.S. Department of Agriculture at Washington, D.C. During his stay in the States, Burtt Davy wrote several papers on the vegetation of various parts of the country. These included "The Stock Ranges of North-western California", "The Native Vegetation and Crops of the Colorado Delta in the Salton Basin". He wrote the section on the *Gramineae* for Jepson's "Flora of the Western Middle California".

His connection with South Africa began in May, 1903, when he was appointed Agrostologist and Botanist in the newly formed Transvaal Department of Agriculture. Under the South African Republic there was no Department of Agriculture, nor, with the exception of a few agricultural societies, was there any agricultural organization whatever, so that the establishment of a Department of Agriculture represented an entirely new venture in the history of the agriculture of the Colony. In his first annual report he records having placed over 3,300 species in the newly formed Herbarium during his year. Burtt Davy was very interested in the subject of plant introduction and devoted much time to the introduction of seed and plants from various parts of the world. These were tested out at the various experiment stations. An outstanding success was the introduction of teff as a forage crop. His interest in plants was wide and many of his publications deal with various branches of botany.

In 1905, His Excellency the Lieutenant-Governor appointed Burtt Davy an expert member of the Committee of the Transvaal Museum and Zoological Gardens to assist in the development of the Herbarium in the Museum and to help with the laying out and planting of the Zoological Gardens.

In 1907 he took charge of the South African Productions Exhibition in London, and while overseas took the opportunity of visiting southern Europe and northern Africa to study methods of growing certain warm temperate crops and also to obtain seed of crops that he considered particularly adaptable to Transvaal conditions. He also paid a visit to America to study methods of plant breeding with particular reference to maize. While in England he spent some time at the herbarium of the Royal Botanic Gardens at Kew, studying the types and naming specimens of Transvaal trees. This resulted in the publication of his "Geographical Distribution of the Native Trees of the Transvaal". He gave an illustrated lecture on "The Agricultural and Pastoral possibilities of the Transvaal" at the Royal Colonial Institute. This lecture was published in the proceedings of the Society.

In 1908 he was instrumental in establishing a large maize breeding station at Vereeniging. His interest in maize resulted in a comprehensive work published in 1913 under the title "Maize, its History, Cultivation, Handling and Uses", which remained until recently the standard work in South Africa on this subject.

At the time of Union, the Transvaal was the only province that had an organised Division of Botany, and Burt Davy, as its Chief continued to hold office as Government Agrostologist and Chief of the Union's Division of Botany. He resigned this post in 1913 in order to engage in the breeding of farm seeds on his own account at Vereeniging.

After the last war he left South Africa for England and settled at Kew where he began his work on "The Flora of the Transvaal and Swaziland". Two volumes of this work have already been published and his loss will be felt the more by South African botanists as this work at the time of his death was still uncompleted. In 1925 he was appointed Lecturer in Tropical Forest Botany at the Imperial Forestry Institute, Oxford and retained the post up to his death.

During the tenure of his lectureship he was responsible for the training of many students who later filled forestry posts in the Colonial Service. With the help of these students he built up a large forestry herbarium at Oxford, comprising material from all over the British Empire. While at Oxford he was one of the co-editors of a series of publications entitled "The Forest Trees and Timbers of the British Empire", of which the following are of particular interest to South African botanists and foresters:—

Some East African *Coniferae* and *Leguminosae*.

Fifteen South African High Forest Trees.

Fifteen Uganda Timbers.

Burt Davy visited the Union in 1929 as a delegate of the Forestry Section of the British Association for the Advancement of Science. On this occasion he took the opportunity by personal collection of enriching still further the Forest Herbarium at Oxford.

No account of Burt Davy's career would be complete without a reference to his wife, Mrs. Alice Burt Davy. This able and gifted American woman whom he married in California, illustrated many of his contributions and reports on botany.

Burt Davy was a Council Member of the South African Association for the Advancement of Science as far back as 1908; he was elected a Member of the Linnean Society in 1903, a Fellow of the Royal Society of South Africa in 1905, and a Fellow of the Royal Geographical Society.

Dr. Burt Davy has without doubt left his mark on South African botany and agriculture, and during his residence in the country gave loyal and devoted service. A former Secretary for Agriculture in one of his annual reports, wrote:

"During the time he was in the Government Service, Mr. Burt Davy performed an immense amount of most valuable scientific and educational work, and the services he rendered the country, particularly in connection with the popularisation of teff grass, and the assistance and impetus he gave to mealie growing, will always be regarded as landmarks in the history of South African agriculture".

SOME SOUTH AFRICAN VALSACEAE.

By Ethel M. Doidge.

Very little is known of fungi, on South African hosts, belonging to the genus *Diatrype* and related genera, except for a small number of species collected in the later years of the 19th century by MacOwan and Medley Wood; most of these were named and described by Kalchbrenner and Cooke (6).

Part of the type collections of some of these fungi is to be found in the Cryptogamic Herbarium at Pretoria or in the South African Museum in Cape Town. The type material of other species appears to consist of small fragments in the Kew Herbarium or in the Berlin Herbarium.

As opportunity offered, a search has been made for fresh material of MacOwan's fungi and those of Medley Wood; in one or two cases the search was successful, and amongst the specimens examined there were a number of species apparently undescribed. Some of these were recently described by Sydow (8) and further species are described in the present paper, in which are included descriptions of all fungi of this group recorded from South Africa.

Some of the type collections made by MacOwan and Medley Wood are in excellent condition, but others are fragmentary and confused, more than a single fungus being included under a single collector's number. A careful study has been made of the material available, and it has been possible in most cases to write a detailed description of the older species. Berlese's drawings (1) have proved very helpful, and three of them are reproduced. I am indebted to the Director of the Imperial Mycological Institute for photographs of the original plates.

During recent years a number of workers, including von Höhnelt, Sydow, Theissen, Petrak and others, have studied the morphology and taxonomy of the stromatic Sphaeriales. Several systems of classification have been proposed, based in some cases on the imperfect forms associated with the ascus stage. In particular may be mentioned von Höhnelt's classification of the Allantosphaeriaceae and Diaportheae (9) and the cultural studies of Wehmeyer (10).

Except in the case of parasites of cultivated plants, some of which occur only in the conidial stage in South Africa, information is lacking with regard to the imperfect forms of the South African species. There has been no opportunity for making cultural studies, and no conidial forms have been found occurring naturally in association with the ascus forms. In this preliminary study, therefore, no attempt could be made at a natural classification and an artificial key to the genera is given. The genera included are those classified in the family Valsaceae in Volume XXIV of Saccardo's *Sylloge Fungorum*.

I am indebted to Miss E. M. Wakefield, to Mr. E. W. Mason and to Dr. H. Sydow for help and advice in connection with some of the species, and to Mr. A. H. V. King for the excellent photographs illustrating the paper.

A note seems necessary about the interpretation of the term "ostiole"; there seems to be no general agreement among mycologists as to the definition of this term. In the recent description published by Sydow, it is applied to the whole papilla or neck of the perithecium, and it is used in that sense in this paper.

VALSACEAE.

KEY TO GENERA RECORDED FROM SOUTH AFRICA.

A.—Spores allantoid, hyaline or sub-hyaline.

(a) *Perithecia caespitose*, without distinct stroma.

1. *Perithecia* beaked..... *Calosphaeria*.
 2. *Perithecia* not beaked..... *Erostella*.

(b) *Perithecia* in a stroma.

1. Asci with tapering, persistent stalks, forming a definite, persistent layer ; ostioles sulcate.
 (aa) Stroma formed from the changed matrix, asci 8-spored..... *Eutypella*.
 (bb) Stroma different from the matrix.
 (i) Asci 8-spored..... *Diatrype*.
 (ii) Asci many-spored..... *Diatrypella*.
 2. Asci with evanescent stalks, soluble in water, often almost filling the perithecial cavity,
 (aa) Ostioles fasciculate, long, protruding, entire or sulcate..... *Peroneutypella*.
 (bb) Ostioles converging, not protruding or slightly so, entire..... *Valsa*.

B.—Spores 1-celled, hyaline, not allantoid, stroma valsiform, perithecia circinate.... *Cryptosporella*.C.—Spores hyaline, 1-septate..... *Diaporthe*.

D.—Spores brown, 1-septate.

- (a) Stroma phyllogenous..... *Pseudothisia*.
 (b) Stroma not phyllogenous..... *Valsaria*.

E.—Spores hyaline, 2- or more-septate.

- (a) Stroma superficial..... *Holstiella*.
 (b) Stroma immersed..... *Calospora*.

CALOSPHERIA Tul.

Select. Fung. Carp. (1861-1865).

Stroma none, perithecia free or seated on the inner bark, scattered, or more frequently collected in more or less distinctly circinate groups. Ostioles more or less elongated. Asci clavate, generally racemose-fasciculate, sessile or stipitate, 8-spored. Paraphyses usually much longer than the asci, stout, evanescent. Spores allantoid.

Calosphaeria princeps Tul.

Sel. Fung. Carp. II. p. 109 ; Sacc. Syll. Fung. I. p. 95 ; Ellis and Everhart, North. Amer. Pyren. (1892) p. 507.

Plate 1.

Stroma none. Perithecia lying on the surface of the inner bark, and attached to it in groups which are round to elliptic in outline, scattered and mostly up to 5 mm. diam.

Perithecia densely crowded, black, smooth, shining, globose, circinate, 450-600 μ diam., narrowing suddenly above into the ostioles. Ostioles prolonged into long necks, which are centripetal, converging towards a crack in the outer bark which is slightly raised, very long,

flexuous, cylindrical, about 150μ thick; becoming fasciculate, ascending and finally erect near the apex in the centre of the group. Perithecial wall blackish-brown, sub-opaque, firm, membranous, $30-50\mu$ thick, composed of roundish-angular, rather thin-walled cells $4-7.5\mu$ diam.; at the point of attachment to the inner bark, the wall is continuous with a short foot of smaller-celled tissue (cells $2-2.5\mu$ diam.) which penetrates into the tissue of the host, and resolves itself into light brown, tortuous, branching hyphae $2-2.5\mu$ thick, which penetrate more deeply into the host tissues.

Asci very numerous, 8-spored, clavate, rounded above, tapering below into a slender hyaline stalk, sp. part $18-26 \times 3.5-5\mu$. Paraphyses very numerous, simple, hyaline, rather thick, far exceeding the asci. Spores loosely conglobate, hyaline, allantoid, rounded at the ends, $4-6 \times 1.25-1.5\mu$.

on *Prunus armeniaca* L., on dead branches, Swinburne near Harrismith, Petty, 2237; Dundee, Doidge, 15499.

Prunus persica Stokes, Marianthall, Ixopo, Pole Erens, 5609; Parys, Town Clerk, 14107.

Erostella (Sacc.) Trav.

Fl. ital. Crypt. Fung. Pyren. fasc. I (1906) p. 155.

Syn. *Togninia* Berl. Icon. Fung. III (1900) p. 9.

Calosphaeria, sub-gen. *Erostella* Sacc. Syll. Fung. I (1882) p. 101.

Like *Calosphaeria*, but perithecia not beaked.

Erostella quaternarioides (Berl.) Sacc.

Syll. Fung. XXII (1913) p. 353.

Syn. *Togninia quaternarioides* Berl. Icones Fung. III (1900) Tab. XIV fig. 1.

Plate 4 a.

Perithecia developed in the cortex, in valsiform acervulae, in groups of 4-5, covered by the raised periderm, ovoid, or, not infrequently, angular through compression, black, 500μ diam., constricted above into a thick ostiole traversed by a pore.

Asci clavulate, $30-40 \times 6-7\mu$, tapering below into a long, slender stalk. Spores allantoid, pale greenish yellow, $8-12 \times 3-4\mu$.

on branches, South Africa; associated with *Peroneutypella cylindrica* (Kalch. et Cke.) Berl.

8

This fungus was not detected on the type material of *P. cylindrica* in Kew Herbarium nor was it found in recent collections of this fungus. The above description is after Berlese and his drawing is reproduced.

Eutypella Nits. (ut sub-gen.)

Pyren. Germ. 2 (1870) p. 163; Sacc. Consp. Gen. Pyr. (1876) p. 4.

Stroma usually well developed, effuse or isolated, bounded by a dark marginal zone, formed from fungus hyphae permeating the host tissues which are more or less altered. Perithecia usually erumpent in groups; ostioles not protruding or slightly so, sulcate. Asci 8-spored. Spores allantoid, 1-celled, yellowish to brownish.

KEY TO SPECIES.

- A.—Stroma effuse, spores $8-15 \times 2-2.5 \mu$ *Eu. Acaciae*.
- B.—Stroma limited.
- (a) Ostioles 400μ long or more, usually longer than the perithecia.
1. Spores $5-6.5 \times 1 \mu$, on *Lycium*..... *Eu. Lycii*.
2. Spores $4-9 \times 1.5-2 \mu$.
- (i) on deciduous trees..... *Eu. stellulata*.
- (ii) on *Citrus*..... *Eu. citricola*.
- (b) Ostioles up to 350μ long, usually shorter than the perithecia.
- (i) Perithecia $500-700 \mu$ diam..... *Eu. MacOwani*.
- (ii) Perithecia $200-400 \mu$ diam..... *Eu. Doidgeae*.

Eutypella Acaciae Doidge nov. sp.

Plate 6 c.

Stromata widely effuse, developing in the cortex, ca. 2-8 cm. long and up to 2 cm., broad, irregular, the limits being indicated by black lines in the outer layers of the wood; consisting of a pale to dark fungous tissue amongst the cells of the host, which are unaltered or only slightly so.

Perithecia monostichous, scattered or in irregular series, sometimes solitary, but usually in groups of 2-5, rarely up to 8, completely immersed, globose to ovate, occasionally flat-sided through mutual pressure, $330-550 \mu$ diam., $400-529 \mu$ high, narrowing suddenly above into rather thick, cylindrical ostioles. Ostioles more or less convergent, rather closely connate and fused with the tissue of the stroma, seldom single, usually in groups, $300-350 \mu$ long, protuding slightly but definitely through cracks in the periderm, delicately 3-5-sulcate, traversed by a pore which is lined with copious fine, hyaline, spreading periphyses. Perithecial wall firm, membranous, blackish-brown, composed of several layers of compressed cells, about 20μ thick at the base and sides, giving place within to a rather loosely woven, hyaline, filamentous, concentric layer about equal in thickness. Asci very numerous, clavate, 8-spored, sp. part ellipsoid to fusoid, rounded above, $35-40 \times 6-6.5 \mu$ tapering below into a long slender stalk. Spores distichous to tristichous, pale olivaceous, allantoid, continuous, rounded at the ends, more or less curved, outer wall often semi-circular, $8-15 \times 2-2.5 \mu$.

on dead branches of *Acacia ataxacantha* D.C., Kromrivier, Rustenburg Distr., *Doidge* and *Bottomley*, 30476.

Eutypella Lycii Doidge, nov. sp.

Stromata scattered, or in irregular rows paralld with the axis of the stem, discrete, rather distant from one another, black, carbonaceous, up to 1.5 mm. diam., conical truncate on a circular or broadly elliptic base, grossly verrucose at the surface, immersed in the cortex from which the ostioles only are erumpent.

Lower part of the stroma consisting of a hyaline or sub-hyaline, filamentous, more or less closely interwoven fungous tissue, interrupted by the golden yellow, slightly altered remnants of the tissue of the host; becoming more closely interwoven and brown above, where it is traversed by the ostioles, and at the sides, where the periderm of the host is firmly adherent; at the surface, from which the ostioles protude, there is a carbonaceous crust consisting of blackish-brown, opaque, round to angular, parenchymatous cells, $4-6 \mu$ diam.

Perithecia monostichous, usually 1-7, rarely 8-13 in each stroma, arranged in a circle or somewhat irregularly, globose to ovate, or flat-sided through mutual pressure, $350-450 \mu$ diam., $400-475 \mu$ high, narrowing suddenly above into the ostioles. Ostioles more or less

curved, 500–550 μ long, convergent, cylindrical below, broadening somewhat towards the apex, which is rather deeply 3–5-sulcate and which protrudes slightly from the stroma; traversed by a narrow funnel-shaped pore, which is about 60 μ broad at the base and widens upwards and is lined with numerous, fine, hyaline, ascending periphyses. Perithecial wall firm, membranous, about 25 μ thick, composed of several layers of rather thin-walled, blackish-brown, compressed cells, which give place internally to a concentric, hyaline, filamentous layer of about equal thickness; in the ostioles, the cells are light yellow-brown, translucent, elongated, in more or less regular rows following the course of the ostioles, becoming darker and shorter upwards and terminating in a blackish-brown, opaque tissue similar to that of the stromatic crust. Asci very numerous, 8-spored, clavate, less frequently sub-fusiform, total length 35–40 μ , rounded above, tapering below into a slender stalk of varying length, sp. part 25–28 \times 3.75–5 μ . Spores distichous, continuous, allantoid, rounded at the ends, more or less curved, rarely almost straight, sub-hyaline, pale olivaceous in mass, 5–6.5 \times 1 μ . Paraphyses not seen.

on branches of *Lycium echinatum* Dun., Aliwal North, Pienaar, 2094.

Spegazzini has described *Eutypella andicola* (Syll. Fung. 24 p. 723) on *Lycium* spp. from the Argentine. No specimen of this species has been available for comparison, but judging from the description, it differs considerably from the fungus described above.

***Eutypella MacOwani* Doidge nov. sp.**

Plate 8 a.

Stromata single, scattered irregularly or somewhat crowded over large areas of the branch, usually discrete, rarely becoming confluent, more or less circular in outline, occasionally elliptic, broadly truncate conoid, 1–2 mm. diam., pushing up the periderm into raised pustules which split in more or less stellate fashion; the surface of the stroma becomes more or less erumpent, often remaining partly veiled by the torn periderm.

The lower part of the stroma consists of a filamentous, more or less closely interwoven fungous tissue among the golden yellow to brown elements of the host, which are not altered or only slightly so. At the surface there is a brittle, black, opaque, carbonaceous crust, 45–80 μ thick, traversed by the ostioles and consisting of blackish-brown, irregularly angular cells 4–6 μ diam. With age, the outer crust often breaks away, leaving the ostioles and the upper part of the perithecia exposed.

Perithecia monostichous, 3–6, rarely up to 10 in a single stroma, globose or broadly ovate, rarely flat sided through lateral pressure, 500–700 μ diam., 600–800 μ high, narrowing suddenly above into thick, cylindrical ostioles. Ostioles 200–300 μ long, 200–300 μ thick, usually separately erumpent, not protruding or very slightly so, 3–5-sulcate, traversed by a broad pore which is lined with numerous hyaline periphyses. Perithecial wall rather thick, membranous, blackish-brown, opaque, 20–25 μ thick, less frequently up to 30 μ thick, giving place internally to a pale yellowish concentric, filamentous layer 8–10 μ thick. Asci very numerous, 8-spored, clavate, rounded above, tapering below into a long, slender stalk, sp. part 20–30 \times 5–6 μ . Spores distichous, allantoid, more or less curved, rarely almost straight, sub-hyaline, light yellow brown in mass, 7.5–10 \times 1.75–2.5 μ . Paraphyses not seen.

on branches of unknown tree (? Somerset East), *MacOwan* 1334b, 22005. I. Herb. Kew sub *Diatrype Durieui* Mont. [*Grevillea* X (1882) p. 146].

According to Ellis and Everhart (3, p. 570) *D. Durieui* is a synonym for *D. albopruinosa*, which is a true *Diatrype* with 10–30 perithecia in a stroma and spores 12–16 \times 2.5–4 μ . *MacOwan* 1344b differs in external appearance from the type of *Diatrype Durieui* in Kew Herbarium and the host is different; the type is on oak branches from Algeria.

It is difficult to obtain accurate measurements of the asci, as they disintegrate very readily in the old material.

Eutypella stellulata Fr. (Sacc.).

Syll. Fung. I (1882) p. 149; Ell. and Ev., North Amer. Pyren. (1892) p. 489; Hopkins, Trans. Rhod. Sc. Ass. 35 (1938) p. 101.

Syn.: *Valsa stellulata* Fr. Summ. Veg. Scand. p. 311; Medley Wood, Rept. Natal Bot. Gdns. (1898) p. 19.

Plate 7 b, c.

Stromata scattered over large areas of the stem, minute, round to elliptic in outline, 1–2 mm. diam., sometimes becoming confluent in small groups, black, carbonaceous, verrucose; developing in the cortex, pushing up the periderm into raised pustules which soon crack irregularly or in stellate fashion; the periderm remains partly veiling the stroma, from which only the groups of black sulcate ostioles are erumpent.

The inner part of the stroma consists of a fungous tissue formed of more or less closely interwoven, sub-hyaline to dark brown hyphae, interrupted by the unaltered or slightly altered cells of the host. At the surface this becomes more closely compacted, and forms an irregular, carbonaceous, opaque, black crust, 20–35 μ thick, interrupted by the groups of ostioles.

Perithecia usually 2–12 in a single stroma, ovate to oblong, closely crowded, often flat-sided through mutual pressure, 200–375 μ diam., 500–600 μ high, narrowing above suddenly or rather gradually into rather long, cylindrical ostioles. Ostioles cylindrical, convergent, fasciculate, 400–700 μ long, erumpent in groups, connate—at least below—protruding up to 500 μ from the stroma, traversed by an irregular pore, 15–25 μ diam., which is rather sparsely lined with short, hyaline periphyses. Perithecial wall firm, membranous, opaque, blackish-brown, 20–30 μ thick, formed of several layers of compressed, angular, dark brown cells ca. 4–5 μ diam.; giving place internally to a sub-hyaline, concentric, filamentous layer ca. 10 μ thick. Asci numerous, 8-spored, clavate, rounded above, tapering below into a long, slender stalk, sp. part 35–50 \times 5–6 μ . Spores distichous, allantoid, tapering somewhat to rounded ends, slightly curved, rarely almost straight, sub-hyaline, light yellowish brown in mass, 4–8 \times 1.5–2 μ , rarely up to 11 \times 2 μ .

on dry sticks, Inanda, *Medley Wood* 574, 9493, 11109.

on branch of *Pyrus malus* L., Concession, S. Rhodesia, *Hopkins* 3646.

This fungus seems to agree well with *Eu. stellulata*, which occurs commonly on limbs of deciduous trees in the United States and in Europe. The spore measurements agree with those given by Ellis and Everhart (loc. cit.) rather than with those in Saccardo's description. I am indebted to Dr. J. C. Hopkins for a portion of his material of *Eu. stellulata* on *Pyrus*.

Eutypella citricola Syd.

Hedwigia XLIX (1909) p. 80; Sacc. Syll. Fung. XXII, p. 357.

Plate 7 d, e.

Stromata crowded, round to elliptic in outline, 0.75–2 mm. diam., black, pulvinate, often becoming confluent and fused into larger, compound bodies; developing in the cortex and pushing up the periderm, which becomes raised, pustuliform and finally raptures irregularly, exposing the 3–5-sulcate ostioles. The stroma remains veiled by torn fragments of the periderm.

The lower part of the stroma consists of a pale to dark brown fungous tissue, formed of more or less closely interwoven hyphae, 3–4 μ thick, interrupted by the slightly altered or unaltered cells of the host. This becomes more firmly compacted above and at the sides, forming a blackish-brown, opaque, carbonaceous crust, 50–75 μ thick.

Perithecia monostichous, 6–12 in a single stroma, ovate to oblong, closely crowded and usually flat-sided through lateral pressure, 250–400 μ diam., 550–600 μ high, narrowing suddenly, or rather gradually above into the cylindrical ostioles. Ostioles fasciculate, connate, 400–450 μ long, erumpent in groups and protruding 200–400 μ from the stroma; usually ca 200 μ broad; Traversed by a pore 40–60 μ broad lined with numerous,

hyaline periphyse. Perithecial wall firm, membranous, blackish-brown, sub-opaque, 15–25 μ thick; composed of several layers of closely interwoven, rather thin-walled hyphae 3–4 μ thick, giving place rather gradually within to a hyaline or sub-hyaline, filamentous, concentric layer about half its thickness. Asci 8-spored, very numerous, clavate, rounded above, tapering below into a long, slender stalk, sp. part ellipsoid to clavate, 30–40 \times 4–5 μ . Spores distichous, allantoid, broadly rounded at the ends, slightly curved, rarely almost straight, fuscous, yellow brown in massa, 6–9 \times 1.75–2 μ .

on dead wood of *Citrus sinensis* Osbeck, Maritzburg, Natal, *Ackerman* (*Rump* 150) 28468a.

Compared with a specimen from the Philippines identified by Rehm (Baker's Fungi Malayana 137). The South African fungus agrees very well with this collection.

Eutypella Doidgeae Syd.

Ann. Myc. 37 (1939) 189–190.

Plate 8 b, c.

Stromata single, scattered irregularly; or in irregular groups of varying size, and then often closely crowded, and not infrequently confluent or fused in groups of two or more; more or less circular in outline, broadly truncate-conoid, 0.5–1.5 mm. diam., pushing up the periderm into raised pustules, which split irregularly or in stellate fashion; usually only the groups of ostioles are erumpent.

The lower part of the stroma consists of a filamentous, small-celled, more or less closely woven fungous tissue, interrupted by vestiges of the substratum, which are not altered or only slightly; above there is a rather brittle, carbonaceous crust, traversed by the ostioles, and consisting of an almost opaque, blackish-brown, parenchymatous tissue of irregularly angular, rather thick-walled cells, 4–8 μ diam.

Perithecia monostichous, usually 2–6, seldom more, completely immersed in the stroma, globose or broadly ovate, often flat-sided through lateral pressure, 200–400 μ diam., 400–500 μ high, narrowing suddenly above into the thick, cylindrical ostioles; ostioles somewhat elongated, usually definitely protruding, 150–200 μ thick, up to 350 μ long, seldom single, usually erumpent in groups and rather closely connate below, delicately or rather deeply 3–5-sulcate. Perithecial wall rather thick, membranous, mostly about 20 μ thick, composed of closely compressed, rather thick-walled, translucent, blackish-brown cells, which give place internally to a hyaline, concentric, filamentous layer of about equal thickness. Asci very numerous, 8-spored, clavate, less frequently sub-fusiform, broadly rounded above, tapering gradually downwards into a stalk which varies in length, sp. part 28–45 \times 5–7 μ . Spores distichous or imperfectly tristichous, obtusely rounded at the ends not tapering or very slightly so, weakly allantoid, seldom straight, 1-celled, light yellow-brown, rather dark reddish brown in mass, 7–10.5 \times 2–2.5 μ . Paraphyses comparatively numerous, but early collapsing and becoming unrecognisable.

on dead branches of *Halleria lucida* L., Trigaartspoor, Pretoria distr., *Doidge* and *Bottomley*, 30378; Boschfontein, Rustenburg distr., *Doidge* and *Bottomley*, 30897.

Diatrype Fr. emend. Wehm.

Amer. Jour. Bot. XIII (1926) p. 637.

Stroma usually well developed, effuse or isolated. Ectostroma strongly developed and deciduous. Entostroma forming a widely erumpent disk, dark marginal zone present. Perithecia immersed in the stroma, ostioles parallel or scarcely converging, sulcate. Asci 8-spored, with more or less elongated, persistent stalks, resulting in a definite, persistent layer of ascilining the walls of the perithecium. Ascospores allantoid, 1-celled, yellowish-hyaline.

KEY TO SOUTH AFRICAN SPECIES.

A.—Ostioles long, protruding 200–250 μ from the stroma.

- (a) Ostioles 300–400 μ long; spores $6-8 \times 1.75-2 \mu$ *D. Doryalidis*.
 (b) Ostioles 450–550 μ long; Spores $6-10 \times 2-2.5 \mu$ *D. xumenensis*.

B.—Ostioles 150–300 μ long, protruding slightly; spores $10-15 \times 2.5-3 \mu$ *D. conferta*.

C.—Ostioles comparatively short, not protruding or barely so.

- (a) Inner stroma yellow to orange..... *D. auristroma*.
 (b) Inner stroma sub-hyaline to brown.
 (1) Perithecia 300–600 μ diam.; spores $7-11.5 \times 1.75-2.5 \mu$ *D. caulina*.
 (2) Perithecia 180–300 μ diam.; spores $7.5-10 \times 2-2.75 \mu$ *D. MacOwaniana*.
 (3) Perithecia 300–400 μ diam.; spores $10-12.5 \times 2-2.5 \mu$ *D. Leonotidis*.
 (4) Perithecia 300–450 μ diam.; spores $10-15 \times 2.5-3 \mu$ *D. caminata*.

Diatrype Doryalidis Doidge, nov. sp.

Plate 9 a.

Stromata at first scattered, then more or less closely crowded in groups of varying size; immersed in the cortex and pushing up the periderm into raised pustules, which finally rupture irregularly or instellate fashion, exposing the deeply 3–5-sulcate ostioles; the stroma remains partly veiled by the closely adhering periderm. Stromata small, round to elliptic, 0.5–1 mm. diam., discrete, or confluent in groups of 2–3 or more and becoming fused.

The ground tissue of the stroma is hyaline to light yellowish brown, without definitely recognisable structure; at the surface and sides, this gives place to a dark brown, sub-opaque outer crust, 30–75 μ thick, composed of golden brown to dark brown, round to angular cells 2.5–5 μ diam.; at the sides it forms a line of demarcation between individual stromata; on the surface it is partly veiled by torn remnants of the periderm, which adhere to it.

Perithecia 2–6 in a single stroma, arranged in a circle or line, ovate to oblong, often flat-sided through mutual pressure, 300–450 μ diam., 450–500 μ high; narrowed suddenly or rather gradually above into long, cylindrical ostioles. Ostioles parallel or converging slightly, traversing the outer crust of the stroma and fused with it, 300–400 μ long, of which ca. 250 μ protrudes from the stroma, broadening somewhat at the sulcate apex which is 200–250 μ diam.; traversed by a pore ca. 100 μ diam. and lined with numerous, fine hyaline periphyses. Perithecial wall firm, membranous, dark brown, sub-opaque, 20–35 μ thick, composed of golden brown to blackish-brown, thin-walled, angular cells 2.5–5 μ diam.; giving place gradually within to a sub-hyaline, concentric, filamentous layer of about equal thickness. Asci very numerous, 8-spored, clavate, rounded above, tapering below into a very long, slender, hyaline stalk, $30-40 \times 5-6 \mu$. Spores distichous, allantoid, sub-hyaline, yellow brown in mass, rounded at the ends, ~~not~~ tapering, more or less curved, rarely almost straight, $6-8 \times 1.75-2 \mu$.

on stems of *Doryalis rhamnoides* (Burch.) Harv., Knysna, Bottomley, 231060.

Diatrype xumenensis Doidge, nov. sp.

Plates 2 b. and 9 b.

Stromata scattered widely and irregularly, sometimes quite discrete, but usually more or less closely massed together and forming parallel rows or series of varying length, following the direction of the fibres of the host; at first covered, erumpent only at the apex through irregular fissures in the periderm: finally becoming more or less free, but still covered by adhering shreds of the tissues of the host. Stromata round or elliptic in outline, verrucose or pulvinate, about 1 mm. diam.; when closely crowded, becoming more or less completely fused, and forming compound, linear stromata up to 1 cm. long; these often occur in closely crowded groups, and finally form larger stromatal cushions up to 3 cm. long and 5 mm. wide.

Outer crust of the stroma carbonaceous, rather brittle when old, consisting of round or angular, thick-walled, translucent, blackish-brown cells about $5-8\ \mu$ diam.; ground tissue light to dark brown, at the sides composed of cells elongated in a vertical direction; structure between the perithecia not readily recognisable.

Perithecia completely immersed in the stroma, 2-8 in each individual stroma, arranged more or less in a circle or in a row, monostichous, closely crowded, becoming more or less flat-sided and irregular through lateral pressure, $200-450\ \mu$ diam., $450-550\ \mu$ high, often somewhat flattened at the base, where they are seated on the woody elements of the host; narrowing suddenly or rather gradually above into the cylindrical ostioles. Ostioles parallel or somewhat convergent, connate below and fused to the stromatal crust, $450-550\ \mu$ long, protruding ca. $200\ \mu$ from the stroma, $150-300\ \mu$ thick, entire or delicately sulcate, traversed by a pore $70-90\ \mu$ broad and lined with fine hyaline periphyses. Perithecial wall firm membranous, variable in thickness, mostly $16-25\ \mu$ thick at the base and sides, composed of several layers of blackish-brown, compressed, sub-opaque cells, becoming paler and less definite in structure internally and gradually giving place to a hyaline, filamentous, concentric layer. Asci very numerous, 8-spored, clavate, sp. part ellipsoid or somewhat fusoid, $40-45 \times 5.5-6.5\ \mu$, rounded above, tapering below into a long, slender stalk. Spores distichous or imperfectly tristichous, cylindrical, rounded at the ends, allantoid, more or less curved, sub-hyaline, light yellow-brown in mass, $6-10 \times 2-2.5\ \mu$.

on dead branches, Xumeni Forest near Donnybrook, *Morgan* and *Doidge*, 28919.

***Diatrype auristroma* Doidge nov. sp.**

Plates 2 a and 11 a, b.

Stromata usually in groups, less frequently more or less scattered; at first immersed in the cortex with only the black-shining ostioles visible; finally becoming more or less free. The bark breaks away, leaving the stromata exposed, but with shreds of the host tissues adhering to them and partly veiling the surface. Stromata round to elliptic, or elongated in the direction of the fibres of the host, 1-6 mm. long, 1-1.5 mm. broad, pulvinate, up to 1.5 mm. high; usually crowded together in groups up to ca. 2 cm. long and 5 mm. broad.

Stroma seated on the wood or the inner layers of the cortex, attached all along the base, or base more or less contracted; in the latter case the basal part is sterile and is traversed by remnants of the host tissues; the ground tissue between the perithecia consists of cells elongated in a vertical direction. The stroma is bounded by a dark brown layer, $12-15\ \mu$ thick, composed of small parenchymatous cells $3-5\ \mu$ diam.; this is sharply defined at the sides, but at the upper surface, where it is interrupted by the ostioles of the perithecia, it goes over gradually into the ground tissue of the stroma. The ground tissue is golden to orange brown (in Ridgway, Colour Standards and Nomenclature, raw sienna shading in places, especially at the base to xanthine orange); the outer stromatal crust often becomes brittle with age and breaks away, revealing the yellow inner stroma.

Perithecia 5-30, closely crowded, monostichous or sub-distichous (the latter more frequent in stromata with contracted base), ovate, oblong or irregular in shape through mutual pressure, $450-900\ \mu$ high, $220-450\ \mu$ diam.; narrowing above, suddenly or rather gradually into a very short, thick ostiole. Ostioles usually broadly funnel-shaped, less frequently cylindrical, $120-180\ \mu$ long, barely protruding, $100-150\ \mu$ broad at the base and broadening upwards to about $200\ \mu$ at the 3-5-sulcate apex; traversed by a broad pore, lined with numerous hyaline periphyses. Perithecial wall equal in thickness throughout, even in the ostioles, $10-12\ \mu$ thick, dark brown, sub-opaque, composed of several layers of thin-walled, slightly compressed, parenchymatous cells ca. $10-12\ \mu$ diam., giving place suddenly within to a pale golden layer of equal thickness. Asci very numerous, 8-spored, clavate, rounded and somewhat thickened at the apex, sp. part $30-36 \times 5-6\ \mu$, tapering below into a very long, slender stalk. Spores distichous, sub-hyaline or yellowish, olive ochre in mass, allantoid, curved, rarely almost straight, rounded at the ends, not tapering $6-8.5 \times 1.5-1.75\ \mu$.

on dead branches of *Xymalos monospora* Baill., Marwaqa Forest, near Bulwer, *Morgan* and *Doidge*, 31073; Xumeni Forest, near Donnybrook, *Morgan* and *Doidge*, 28929.

on dead branches of *Minusops Zeyheri* Sond., Boschfontein, Rustenburg Distr., *Doidge* and *Bottomley*, 30171.

***Diatrype caulina* Syd.**

Ann. Myc. 37 (1939) pp. 184–186.

Plates 3 b and 9 c.

Stromata in dark spots on the stems, rarely solitary, usually more or less crowded in groups of two or more; these groups are usually irregular, but elongated in the direction of the stem axis, often combining to form irregularly undulating stromatal ribbons of varying breadth. Stromata round to broadly elliptic in outline, rather strongly convex, verrucose or pulvinate, folded or grooved at the surface, 0.7–1.5 mm. diam., or up to 2 mm. long and 1–1.5 mm. broad; sometimes they are placed in short parallel rows, become confluent and fused and form larger compound stromata.

Outer crust of stroma brittle, carbonaceous, 25–80 μ thick, parenthymatous in structure, composed of cells which are almost opaque, blackish-brown, rather thick-walled, irregularly angular, 6–14 μ diam. The ground tissue between the perithecia is almost hyaline, without definitely recognisable structure.

Perithecia few, usually 1–6 in a single stroma, monostichous, rather distant from one another, hence globose, rarely flattened by lateral pressure, 300–600 μ diam., seldom somewhat larger. Ostioles rather short, broadly cylindrical, not protruding from the stroma or very slightly so, entire or very delicately sulcate, traversed by a pore ca. 50–70 μ broad and lined with copious, hyaline, short, spreading periphyses. Perithecial wall membranous, becoming brittle with age, of varying thickness, usually 20–30 μ thick, composed of more or less numerous layers of strongly compressed cells; these are translucent, blackish-brown, irregularly angular, up to 15 μ diam., giving place suddenly within to a sub-hyaline, concentric, filamentous layer. Asci very numerous, clavate or sub-fusiform, broadly rounded above, tapering gradually below into a rather long, delicate stalk, sp. part 26–38 \times 4.5–6.2 μ . Spores distichous or incompletely tristichous, cylindrical, rounded at both ends, allantoid, only slightly curved, seldom almost straight, continuous sub-hyaline, light yellowish-brown in mass, 7–11.5 \times 1.7–2.5 μ . Paraphyses rather numerous, but breaking down early and becoming unrecognisable.

on dead stems of *Asparagus* sp., Dooley, near Mont-aux-Sources, *Doidge*, 13792.

***Diatrype MacOwaniana* Thüm.**

Fungi austro-africani V No. 117, in Flora (1877) p. 4; Sacc. Syll. Fung. I. p. 196.

Syn: *Diatrype capensis* Kalch. et Cke. (not as figured by Berlese) Grevillea IX (1880) p. 28; Sacc. Syll. Fung. I. p. 195;

Diatrype Bona-spei Berl. Icon. Fung. III (1900) p. 87; t. 106, f. 2; Sacc. Syll. Fung. XVII (1905) p. 571; “in herb. Berol. sub nomine err. ‘*Diatrype capensis*’”.

Plate 10.

Stromata scattered over the surface of the stem, often numerous, more or less crowded and becoming coalescent in small groups of 2–3, round to irregular in outline, minute, rarely exceeding 1 mm. in diam., sometimes up to 1.5 mm.; at first completely immersed in the cortex, pushing up the periderm into raised pustules; the periderm finally ruptures, remaining adherent to the sides of the stroma, but exposing its black, pulvinate or somewhat verrucose surface.

Outer crust of stroma rather brittle, opaque, brownish-black, carbonaceous; ground tissue between the perithecia sub-hyaline to pale yellowish-brown and without recognisable structure.

Perithecia 2-8 in a single stroma, arranged in a circle or more or less irregularly, monostichous, sub-globose to ovate, often becoming ellipsoid to oblong through mutual lateral pressure, 180-300 μ diam., 300-400 μ high, narrowing suddenly above into rather short, thick, cylindrical ostioles. Ostioles parallel or somewhat convergent, 150-200 μ long, not protruding from the stroma or very slightly so, fused at the apex with the black outer crust of the stroma; traversed by a pore 50-60 μ diam., which is lined with numerous, fine, hyaline periphyses. Perithecial wall firm, dark brown, sub-opaque, about 10 μ thick. Asci numerous, lining the perithecial cavity, clavate, 8-spored, sp. part 35-40 \times 5-6.5 μ , tapering below into a long, slender stalk. Spores distichous or imperfectly tristichous, very pale, olivaceous, light yellow brown in mass, continuous, allantoid, rounded at the ends, only very slightly curved, 7.5-10 \times 2-27.5 μ .

on stems of *Cassinopsis capensis* Sond., Boschberg, Somerset East, MacOwan 1264, 20951a.

Diatrype MacOwaniana was described by von Thümen (loc. cit.) in 1876; the type collection was MacOwan 1264, the host being given as *Cassine capensis*. It seems evident that a clerical error was made in transcribing the name of the host, which is *Cassinopsis capensis* Sond. *Cassine capensis* L. is a shrub limited to the south-western Cape, and it is unlikely that it would be found growing in the Boschberg, near Somerset East.

In Grevillea X (1882) the same collection, MacOwan 1264, was quoted by Kalchbrenner and Cooke as the type of *Diatrype capensis*, the host being correctly given as *Cassinopsis capensis*.

Berlese (Icones III, p. 95) quoted the original description of *D. MacOwaniana*, which he said he had not seen. He found two different fungi included in the type collection of *D. capensis*, and described and figured under this name a fungus with spores 4-5 \times 1.5 μ (In the original description of *D. capensis*, the spores are said to be 10 \times 2 μ).

Berlese also described and figured as a new species *Diatrype Bona-spei*, "Ex specim. *Diatrype capensis* a cl. MacOwan lectis in Herb. Musaei Berol. servatis et mihi a cl. Prof. J. Urban benevole communicatis". This fungus has spores 9-11 \times 2-2.5 μ that is to say,, they agree in measurement with those of *D. capensis* as described by Kalchbrenner and Cooke.

In a recent letter Dr. Sydow stated that the portions of MacOwan's collections in the Berlin Herbarium were very small and in poor condition, and an examination of these failed to clear up the species described by Berlese.

The material in Kew Herbarium is also somewhat fragmentary. The portion of the collection MacOwan 1264 in the cryptogamic herbarium at Pretoria consists of a small branch of *Cassinopsis capensis* and two small pieces of bark from a different tree. The former has been given the number 20951a, and is obviously part of the collection from which both *D. MacOwaniana* and *D. Capensis* were described. The latter (20951b) is identical with a specimen at Kew under the name "*Diatrype cingesta* K. et Cke, Cape, Kalchbrenner R 23". I am unable to find any description of this species, and as the material is in very poor condition, being too old to show either spores or asci, it must be disregarded.

The fungus on *Rubus*, MacOwan 1350, 1344 (Herb. Kew and Pretoria Nos. 21998, 22005) quoted under the name *Diatrype capensis* in Grevillea (l.c.) differs from that on *Cassinopsis capensis*; the material is all too old for detailed study, lacking both asci and spores, and must be disregarded until it can be found again in better condition.

The name *Diatrype MacOwaniana* Thüm. must therefore be adopted for the collection MacOwan 1264, which is on *Cassinopsis capensis*; *D. capensis* K. et Cke. is the same fungus.

Berlese's species *D. Bona-spei* agrees in spore measurements with those given in the original description of *D. capensis*, and his other details and drawings conform with the general structure of that species; the name *D. Bona-spei* must also be regarded as a synonym for *D. MacOwaniana*. Berlese's drawing is reproduced, for comparison with a photograph of a section made from MacOwan 1264;

It is impossible to say what Berlese described and figured as *Diatrype capensis*, with spores 4-5 \times 1.5 μ .

Diatrype Leonotidis Doidge nov. sp.

Plate 9 d.

Stromata usually scattered fairly evenly over the surface of the stem, usually discrete, round or somewhat elongated, minute up to $2.5\ \mu$ diam.; occasionally, when numerous and crowded, 2 or more become fused and form larger, irregular compound stromata. **Stromata** at first completely immersed in the cortex, pushing up the periderm into raised pustules; the periderm finally ruptures in stellate fashion or irregularly, remaining closely adherent at the sides, but exposing more or less the black, pulvinate or verrucose surface of the stroma, which often remains partially veiled by torn fragments of the periderm.

The stroma consists of a rather brittle, sub-opaque, carbonaceous outer crust, about $50\ \mu$ thick, composed of roundish-angular, blackish-brown cells $3.5\text{--}5\ \mu$ diam.; within the ground tissue between the perithecia is sub-hyaline to pale yellowish brown, compact, but without recognisable structure.

Perithecia usually 3-5, rarely up to 8 in a single stroma, arranged in a circle or more or less irregularly, monostichous, globose to ovate, often flattened laterally by mutual pressure, $300\text{--}400\ \mu$ diam., narrowing suddenly above into the rather short, thick, cylindrical ostioles. Ostioles parallel or somewhat convergent, $100\text{--}150\ \mu$ long, not protruding from the stroma, or protruding slightly, and then rather shining black and deeply 3-5 sulcate; traversed by a pore about $50\text{--}75\ \mu$ broad, which is cylindrical, or broadens upwards to ca. $85\text{--}87.5\ \mu$; it is lined with comparatively coarse, spreading hyaline periphyses. Perithecial wall firm, membranous, mostly $12\text{--}15\ \mu$ thick, composed of several layers of compressed, angular, blackish-brown, rather thin-walled, translucent cells; giving place internally to a hyaline, concentric, filamentous layer of about equal thickness. Asci numerous, clavate, 8-spored, sp. part fusiform, $35\text{--}45 \times 6\text{--}8\ \mu$, rounded above, tapering below into a long slender stalk. Spores distichous, continuous, allantoid, light yellow brown, slightly curved, $10\text{--}12.5 \times 2\text{--}2.5\ \mu$. Paraphyses hyaline, filiform, about $1\ \mu$ thick.

on dying stems of *Leonotis* sp., Hlabini, Polela Distr., Doidge, 29821.

Diatrype caminata Kalch. et Cke.

Grevillea IX (1880) p. 28; Sacc. Syll. Fung. I, p. 197; Berlese, Icon. Fung. III (1900) p. 92, t. CXIII, fig. 2.

Plate 12 a, b.

Stromata scattered or in groups, discrete or becoming confluent in small groups or series, irregularly round, up to 1 mm. diam., or broadly elliptic and up to 2 mm. long; at first completely immersed in the cortex, rupturing the periderm and exposing the surface of the stroma, which is black, carbonaceous, pulvinate or verrucose, with dull black, 3-5-sulcate, ostioles barely protruding; finally the bark breaks away, leaving the stromata exposed, attached to the wood or to the inner layers of the cortex.

Ground tissue of stroma hyaline or sub-hyaline, without definitely recognisable structure. Outer crust black, carbonaceous, irregular in thickness, $50\text{--}130\ \mu$ thick, formed of thin-walled, blackish-brown, globose to angular, parenchymatous cells, $3\text{--}5\ \mu$ diam. The Torn periderm of the host adheres closely to the sides of the stroma.

Perithecia 4-12 in a single stroma, rather large, oblong to ovate, not laterally compressed or very slightly so, $300\text{--}450\ \mu$ diam., $450\text{--}600\ \mu$ high, narrowed above into short broad ostioles. Ostioles parallel, narrow funnel-shaped, $200\text{--}250\ \mu$ long, $150\ \mu$ broad at the base, broadening to about $200\ \mu$ at the sulcate apex which is fused to the outer crust of the stroma and protrudes only slightly; traversed by a pore lined with numerous, fine, hyaline periphyses. Perithecial wall opaque, blackish-brown, $15\text{--}20\ \mu$ thick, composed of a number of layers of compressed cells, which are thin-walled, blackish-brown and up to $15\ \mu$ diam.; giving place suddenly within to a sub-hyaline, concentric, filamentous layer. Asci numerous, 8-spored, clavate, rounded and somewhat thickened at the apex, tapering below into a slender stalk, sp. part $40\text{--}50 \times 6\text{--}8\ \mu$. Spores distichous or sub-tristichous, allantoid

slightly curved, rarely almost straight, rounded at ends, not tapering or very slightly so, sub-hyaline, pale olivaceous in mass, $10-14 \times 2.5-3 \mu$. Paraphyses sparse, disappearing early.

on branches, Cape, *MacOwan* 1263, Type in Herb. Kew.

on branch of *Halleria lucida* L., Knysna, *Bottomley*, 31059.

The type collection, *MacOwan* 1263, is missing from the Cryptogamic Herbarium at Pretoria, and I am indebted to the Director of the Royal Botanic Gardens for a fragment of the type specimen in Kew Herbarium. This material is unfortunately old and no asci or spores could be found, but after studying the stroma and perithecia in section and comparing with Berlese's description and illustrations, little doubt remains that the Knysna collection No. 31059 is *Diatrype caminata*. Berlese's drawing is reproduced for comparison with a photograph of a section through the stroma of No. 31059.

***Diatrype conferta* Doidge, nov. sp.**

Plate 13 a, b.

Stromata in irregular groups or more or less scattered, developing in the cortex but soon becoming erumpent, black, carbonaceous, pulvinate, 1-3 mm. diam., round to elliptic, frequently crowded together and becoming coalescent in small groups. The torn periderm adheres closely to the sides of the stroma, and fragments remain adhering to the surface, which is dull black and rugulose with slightly protruding ostioles.

Stromata seated on the wood, sometimes narrowing somewhat towards the base; inner part light brown at the base, consisting of a fungous tissue composed of rather closely interwoven, thin-walled, yellow brown hyphae, $2.5-3 \mu$ thick; above and between the perithecia it is white, hyaline, and its structure not easily recognisable. At the surface there is an opaque crust, which is firm, black, carbonaceous, irregular in thickness, $30-90 \mu$ thick, composed of blackish-brown, rather thin-walled, angular cells, ca. $2.5-4 \mu$ diam.

Perithecia numerous, up to 30 in a single stroma, crowded, distichous to monostichous, ovate, oblong or irregular through mutual pressure, $250-400 \mu$ diam., up to 550μ high, narrowed rather gradually above into cylindrical or narrow funnel-shaped ostioles. Ostioles $150-300 \mu$ long, fused at the apex with the outer crust of the stroma from which they protrude very slightly, or more decidedly (up to 120μ); in the latter case the ostioles are dilated and sub-spherical at the apex and up to 200 or 250μ diam.; traversed by a pore $50-100 \mu$ broad, which is lined with rather coarse, hyaline periphyses. Perithecial wall firm, membranous, blackish-brown, $18-30 \mu$ thick, composed of several layers of compressed cells, giving place inwardly to a sub-hyaline, concentric, filamentous layer $7-10 \mu$ thick. Asci very numerous, clavate, 8-spored, rounded and thickened at the apex, tapering below into a long, slender stalk, sp. part $40-50 \times 7.5-8 \mu$. Spores distichous, pale olive yellow, allantoid, more or less curved, rounded at the ends, $10-15 \times 2.5-3 \mu$; light yellow brown in mass.

on dead branches of tree undet., Xumeni Forest, Donnybrook, *Morgan* and *Doidge*, 30420.

***Diatrypella* Ces. et de Not. emend Wehm.**

Amer. Jour. Bot. 13 (1926) p. 637.

Stroma effuse or isolated. Entostroma well developed, often pustulate, but not usually widely erumpent, bounded by a dark marginal zone. Perithecia immersed in the stroma, clustered or separately erumpent. Ostioles sulcate. Asci with long stalks, polysporous. Spores allantoid, 1-celled, yellow-hyaline.

KEY TO SOUTH AFRICAN SPECIES.

Spores $10-16 \times 2.5-4 \mu$	<i>D. Morganae</i> .
Spores $9-12 \times 2-3 \mu$	<i>D. oligostroma</i> .
Spores $4.5-8 \times 1.5-2.3 \mu$, Perithecia $400-750 \mu$ diam.	<i>D. Agaves</i> .
Spores $5-7.5 \times 1-1.2 \mu$, Perithecia $250-400 \mu$ diam.	<i>D. natalensis</i> .
Spores $2.5-5 \times 1 \mu$	<i>D. pretoriensis</i> .

Diatrypella Agaves Syd.

Ann. Myc. 37 (1939) pp. 186-187.

Plates 3 a and 14 b.

Stromata widely and irregularly scattered, sometimes quite discrete, sometimes more or less closely massed together and forming parallel, longitudinal rows or series of varying length, following the direction of the fibres of the host; usually remaining covered, erumpent only at the apex through fissures in the periderm, finally becoming more or less free, but still covered by adhering shreds of the tissues of the host; less frequently the covering layer of the host tissues fall away completely, and the stromata are apparently superficial. Stromata round, elliptic or irregular in outline, finely verrucose or pulvinate, convex, dull black or blackish-brown, 0.75 to 1.5 mm. diam., or up to 2 mm. long and 1.5 mm. broad; when closely crowded, becoming confluent and more or less completely fused and forming larger, composite stromata.

Parenchymatous tissue of the stroma rather brittle and carbonaceous when old, consisting of round or angular, thick-walled, translucent, blackish-brown cells, $3-6 \mu$ diam.; the ground tissue between the perithecia is often very light yellowish-brown.

Perithecia immersed in the stroma, monostichous, globose or broadly ovate, often somewhat irregular through lateral pressure, very variable in size, usually $400-750 \mu$ diam., narrowing above into comparatively short, thick ostioles. Ostioles not protruding, or protruding slightly from the surface of the stroma, truncate or stellately 5-sulcate, traversed by a pore which is lined with numerous, short, filamentous periphyses. Perithecial wall membranous, usually $20-40 \mu$ thick, composed of a number of layers of rather closely compressed cells; cells thick-walled, translucent, blackish-brown, up to 8μ diam.; giving place suddenly within to a sub-hyaline, indefinitely concentric, filamentous layer. Asci very numerous, many-spored, clavate, broadly rounded above, tapering below into a delicate, rather long stalk, sp. part $68-85 \times 8-12 \mu$. Spores conglobate, cylindrical, broadly rounded at the ends, not tapering or very slightly so, allantoid, slightly curved, less frequently almost straight, 1-celled, hyaline, honey yellow in mass, $4.5-8 \times 1.5-2.3 \mu$. Paraphyses sparse, very broadly filamentous, early collapsing and becoming mucilaginous.

on dying peduncles of *Agave americana* L., The Willows, Pretoria Distr., Doidge and Bottomley, 28899.

Diatrypella natalensis Doidge nov. sp.

Plate 14 c.

Stromata scattered irregularly, sometimes quite discrete, sometimes more or less closely massed together in irregular groups or in short series; more or less circular in outline, up to 1 mm. diam., or elongated and up to 3 mm. long and 1 mm. broad; at first covered, then more or less free, black, convex, pulvinate, the surface roughened by clinging fragments of the ruptured periderm.

At the surface, the stroma is firm, black, opaque, carbonaceous and rather brittle, composed of more or less angular, translucent, blackish-brown, parenchymatous cells ca. $6-8 \mu$ diam.; within it becomes gradually paler and less closely compacted, and the ground tissue between the perithecia is sub-hyaline and more or less filamentous in structure. The unaltered, or somewhat altered elements of the host tissues are in places included in the stroma, especially just under the outer crust.

Perithecia 7-15 in each single stroma, arranged more or less in circles in the round stromata, or in two lines in the elongated stromata; completely immersed, monostichous, globose or ovate, but usually more or less flat-sided and irregular through mutual pressure, 250-400 μ diam., 300-500 μ high, narrowing suddenly above into the short, thick, more or less cylindrical ostioles. Ostioles 150-220 μ long, 100-150 μ broad at the base, usually broadening upwards to 150-200 μ where they protrude slightly from the stroma, shining black, delicately 3-5-sulcate at the apex; traversed by a funnel-shaped pore, which is lined with numerous, hyaline or yellowish, filamentous periphyses. Perithecial wall firm, membranous, 12.5-25 μ thick, composed of several layers of very much flattened, blackish-brown cells measuring up to 15 μ diam.; giving place internally to a concentric, hyaline, filamentous layer of about equal thickness. Asci numerous, closely packed with very numerous, minute spores, clavate, straight or curved, rounded at the apex, tapering downwards into a slender hyaline stalk, sp. part 80-100 \times 12.5-15 μ . Spores allantoid, continuous, more or less curved, rounded at the ends, sub-hyaline, light yellow-brown in mass, 5-7.5 \times 1-1.2 μ . Paraphyses not seen.

on stems of *Citrus nobilis* Lour., Glen Echo, Umtwalumi, Natal, Wayne, 21006.

Diatrypella Morganae Doidge nov. sp.

Plate 13 c.

Stromata scattered over the whole surface of the branch, usually discrete, sometimes more or less crowded, circular or sub-circular in outline, 1-2.5 mm. diam.; pushing up the periderm into raised pustules, but usually remaining covered with only the black shining ostioles erumpent; rarely the bark breaks away irregularly and leaves the stroma exposed.

Intramaterial stroma very poorly developed, consisting of the more or less altered elements of the tissues of the host, between which a fungous tissue can be detected; this is firm and dark at the surface, where there is a poorly developed outer crust, which varies greatly in thickness and is not continuous; within, the fungous tissue is hyaline or light yellow-brown, small celled and indefinitely filamentous.

Perithecia in more or less regular circles, 3-7 in a stroma, often rather irregularly spaced, completely immersed, sub-globose to ovate, either rather distant from one another, or crowded and flat-sided through mutual pressure, 250-500 μ diam., narrowed suddenly above into the thick, cylindrical ostioles. Ostioles mostly 150-200 μ thick, convergent, protruding slightly from the stroma, slightly broader above with delicately sulcate margin, lined internally with numerous, very fine, hyaline periphyses. Perithecial wall firm, membranous, uneven in thickness, mostly 20-30 μ thick at the base and sides, formed of several layers of blackish-brown, translucent, rather thin-walled, compressed cells, which are mostly 10-15 μ diam.; giving place internally to a concentric, hyaline, filamentous layer. Asci numerous, many spored, cylindrical or clavate, rounded above, sessile or briefly pedicellate, 100-125 \times 12-15 μ , at length disappearing and leaving the spores free in the perithecium. Spores allantoid, continuous, rounded at the ends, pale yellow-brown, almost red-brown in mass, 10-16 \times 2.5-4 μ . Paraphyses hyaline, filamentous, disappearing early.

on dry branches of undet. tree, Hlabini, Polela Distr., Natal, *Morgan* and *Doidge*, 29820.

In old stromata, the perithecial cavity is invaded by a second ascomycete, apparently parasitic on the *Diatrypella*. This has 8-spored asci with brown, 3-septate spores, which are sub-cylindrical but tapering somewhat to the rounded ends, slightly constricted at the septa, and about 22-28 \times 6-7 μ .

Diatrypella pretoriensis Doidge, nov. sp.

Plate 15 a, b.

Stromata rather closely crowded, in large irregular groups, usually discrete, more or less circular in outline and up to 1 mm. diam.; at first immersed, then rupturing the blistered periderm and becoming more or less free, convex, pulvinate, the surface being roughened by clinging fragments of the periderm from which only the black, sulcate ostioles protrude; the torn periderm adheres closely to the sides of the stroma.

Ground tissue of stroma hyaline to yellowish-brown, without definitely recognisable structure; some of the less destructible elements of the host tissue are included in places in the stroma; outer crust black, carbonaceous, opaque, varying in thickness, mostly 50–60 μ thick, occasionally up to 75 μ .

Perithecia 2–12 in each stroma, arranged irregularly and usually remote from one another, not crowded, globose to ovate, 400–500 μ diam., narrowed suddenly above into short, cylindrical ostioles. Ostioles 150–220 μ long, about 100 μ broad, expanding at the hemispherical apex to ca. 150 μ , fused with the outer crust of the stroma and barely protruding from it; traversed by a broad pore lined with very numerous, hyaline periphyses. Perithecial wall firm, membranous, 10–12.5 μ thick, blackish-brown, sub-opaque, composed of several layers of angular, thin-walled, compressed cells, ca. 4–6 μ diam.; giving place internally to a rather loosely woven, filamentous, hyaline or pale yellow layer, ca. 15 μ thick. Asci numerous, packed with numerous minute spores, straight or curved, rounded at the apex, tapering downwards into a slender stalk, sp. part 40–60 \times 10–12.5 μ . Paraphyses not seen. Spores allantoid, more or less curved, rarely almost straight, sub-hyaline, light yellow-brown in mass, 2.5–4 \times 1 μ ; less frequently up to 5 μ long.

on roots of *Populus* sp., De Beersrust, Pretoria Distr., *Doidge*, 31072.

***Diatrypella oligostroma* Syd.**

Ann. Myc. 37 (1939) pp. 187–189.

Plate 14 a.

Stromata minute, round, broadly elliptic or rather irregular, flat and verrucose or thick and pulvinate, 1–2 mm. diam.; or more or less effuse, diatrypoid, up to 8 mm. diam., and irregular in outline. Intramatrical stroma poorly developed, consisting of the altered elements of the substratum, between which a fungous tissue can be detected; this is hyaline or light yellow-brown, small-celled and indefinitely filamentous.

Perithecia rather irregularly spaced, monostichous, completely immersed in the stroma, sub-globose, broadly ovate, or becoming flat-sided through lateral pressure, irregular in size, usually 300–600 μ diam. Ostioles broadly cylindrical, single, not fasciculate, protruding slightly but definitely, usually with a narrow funnel-shaped pore and a thickened ring-like margin, sometimes delicately and irregularly sulcate. Perithecial wall rather thick, membranous, 30–50 μ thick, consisting of several layers of very closely compressed cells, 5–8 μ diam.; these are irregularly angular, rather thin-walled, light greyish-brown, and give place internally to a hyaline, concentric, filamentous layer; in the ostiole the tissue is erect, filamentous, and consists of parallel, short-celled, thick-walled hyphae, 2–3 μ thick. Asci very numerous, clavate, broadly rounded above, tapering gradually downwards into a very delicate stalk, thin-walled, many-spored, sp. part 60–85 \times 12–15 μ . Spores conglobate, cylindrical, broadly rounded at the ends, not tapering or slightly so, weakly allantoid, seldom almost straight, light yellow or greyish brown, dark honey yellow in mass, 9–12.5 \times 2–3 μ . Paraphyses very sparse, early collapsing and becoming mucilaginous.

on dead branches of *Halleria lucida* L., Trigaartspoort, Pretoria distr., *Doidge* and *Bottomley*, 30379; Boschfontein, Rustenburg distr., *Doidge* and *Bottomley*, 30896.

associated with *Eutypella Doidgeae* Syd., on the same branches.

***Peroneutypella* Berl.**

Icones Fung. III (1900) p. 82.

Stroma effuse, black, covered by the periderm or the epidermis. Acervuli more or less pustuliform and erumpent. Perithecia more or less numerous in each group, monostichous to polystichous, prolonged into long protruding ostioles. Ostioles entire or sulcate. Asci clavate, filling the perithecial cavity. Spores continuous, allantoid, hyaline or sub-hyaline, often yellowish-brown in mass.

V. Höhnelt (9 : pp. 130, 132) includes this genus in his sub-family *Valseae*, but regards *Peroneutypella* Berl. as a synonym for *Scoptria* Nits.

KEY TO SOUTH AFRICAN SPECIES.

- Ostioles entire, sterile emergences present..... *P. cylindrica*.
 Ostioles sulcate, no sterile emergences..... *P. infinitissima*.

Peroneutypella cylindrica (K. et Cke.) Berl.

Icones Fung. III (1900) p. 82, Tab. C (ex specimen origin. a cl. Cooke).

Syn : *Ceratostoma cylindrica* K. et Cke., Grev. IX. (1880) p. 29, t. 137, f. 28.

Calosphaeria cylindrica (K. et Cke.) Sacc., Syll. Fung. I, p. 98.

Plates 3 b and 5 a, b.

Stromata widely effuse, developing in the cortex and spreading over large areas of the branch ; acervuli numerous, scattered, irregularly round and ca. 0.5 mm. diam., or somewhat elongated and up to 1 mm. long ; sometimes crowded in short, irregular series parallel with the axis of the branch. The long ostioles, surrounded by sterile, setal-like emergences, become erumpent through longitudinal cracks in the bark and give the appearance of tufts of short, stiff, black hairs, visible to the naked eye.

The lower part of the stroma consists of a more or less closely interwoven tissue of fine hyphae, sub-hyaline to light yellowish-brown, permeating the cells of the host which are unaltered or only slightly altered. The fungous tissue becomes more compact near the upper surface, and forms, above the perithecia, a dark brown, sub-opaque, parenchymatous layer, composed of cells which are rather thin-walled and ca. 4-5 μ diam. Frequently this outer crust gives rise to erect, brown, turf-like tufts of stromatal tissue, 100-150 μ high, which remain covered by the periderm. In the immediate vicinity of the fasciculate ostioles, the stromatal tissue is prolonged into spreading or erect plates, which taper from a rather broad base ; these are composed of olive brown, parallel, rather thick-walled hyphae, 2.5-3 μ thick, irregularly and rather distantly septate and fused by their lateral walls. These sterile emergences are almost equal in length to the protruding ostioles.

Perithecia monostichous, rarely sub-distichous, deeply immersed in the stroma, usually in groups of 2-7, rarely up to 9, globose to ovate, sometimes becoming ellipsoid through lateral pressure, 350-650 μ diam., 550-750 μ high, narrowing suddenly above into long, cylindrical ostioles. Perithecial wall blackish-brown, opaque, firm membranous, mostly 45-50 μ thick ; giving place within to a sub-hyaline layer, 10-12 μ thick, composed of several layers of thin-walled, strongly compressed cells ; in the ostioles the wall consists of oblong cells, arranged in ascending, more or less vertical rows. Ostioles fasciculate, converging to the outer surface of the stroma, where they are more or less connate, then erumpent, erect or more or less divergent ; 1.5-1.7 mm. long, of which ca. 1 mm. protrudes from the stroma, readily breaking off just above the surface of the branch and becoming truncate, irregularly cylindrical, 100-150 μ thick, entire and rounded at the apex ; traversed by a pore, 50-75 μ broad, which is lined with fine, hyaline periphyses. Asci extremely numerous, almost filling the perithecial cavity, 8-spored, clavate, rounded above, tapering below into a slender stalk which is of varying length, sp. part 15-18 \times 4-5 μ . Spores distichous, allantoid, sub-hyaline, pale olivaceous in mass, curved, minute, 3-4 \times 1-1.25 μ .

on dead branches of ?*Solanum auriculatum* Ait., Xumeni Forest, Donnybrook, Natal, Morgan and Doidge, 28918, 31061, 31064 ; Woodbush, K. M. Putterill, 30753.

Compared with a fragment of the co-type in Herb. Kew sub *Calosphaeria cylindrica* (K. et Cke.) Sacc., "Cap. B.Sp. et P. Natal, comm. MacOwan." The type collection is missing from the Cryptogamic Herbarium in Pretoria.

Peroneutypella infinitissima (K. et Cke.) Doidge n. comb.

Syn. *Valsa infinitissima* Kalch. et Cke., Grevillea IX (1880) p. 28 ; Sacc. Syll. Fung. I. p. 144.
Plate 4 a, b.

Stromata scattered over the surface of the branch, usually remote, discrete, very rarely close together and becoming confluent, developing in the cortex ; acervuli pustuliform, round to irregular, minute, up to 0.5 mm. diam., remaining covered by the periderm of the host, from which only the ostioles protrude.

The inner part of the stroma consists of a fungous tissue composed of very fine, hyaline to yellowish-brown hyphae which are more or less closely interwoven and permeate the cells of the host which are not altered, or very slightly so. Above, covered by the periderm, the stroma is defined by a dark brown line, consisting of very closely interwoven dark brown hyphae about 2 μ thick, amongst which the outline of the cells of the host is plainly visible. This dark line is also evident irregularly at the base. Apex of stroma pulvinate, consisting of light brown, thin-walled hyphae 2-5 μ thick, much branched and closely interwoven, but more or less vertical ; becoming more closely compact above, and forming a close, brown parenchyma of thin-walled cells 3-5 μ diam. ; this apical tissue is traversed by the ostioles.

Perithecia usually 2-8 in each stroma, rarely up to 15, deeply immersed in the stroma, sub-globose to ovate, usually slightly separated and not compressed, 300-450 μ diam., 400-550 μ high, narrowing suddenly above into long, cylindrical ostioles. Perithecial wall dark brown, firm, membranous, sub-opaque, 20-25 μ thick, composed of several layers of dark brown, somewhat compressed cells ca. 5 μ diam. ; giving place suddenly within to a hyaline layer ca. 10 μ thick. Ostioles long, cylindrical, straight or converging to the apex of the stroma, then diverging slightly or remaining parallel, 900-1200 μ long, only about 200-250 μ being erumpent, slender, ca. 100 μ thick, slightly dilated and delicately 3-5-sulcate at the apex ; wall similar to that of the perithecial cavity ; traversed by a pore, which is lined with numerous, fine, hyaline periphyses. Asci very numerous, filling the perithecial cavity, clavate, 8-spored, sp. part 10-12.5 \times 4-5 μ . Spores allantoid, sub-hyaline, light yellow-brown in mass, rounded at ends, usually strongly curved with the outer wall almost semi-circular, 2.5-4 \times 1-1.25 μ .

on dead branches of undet. tree, Somerset East, *MacOwan 1344a*, 22006.

The long protruding, sulcate ostioles separate this fungus from the genus *Valsa*.

Valsa Fr. emend. Sacc.

Consp. Gen. Pyr. p. 4.

Stromata isolated or confluent, formed from more or less closely interwoven hyphae traversing the tissues of the cortex, which are not altered or only slightly so. Perithecia arranged in a circle, with convergent ostioles ; ostioles entire, not sulcate. Asci sessile or sub-sessile, filling the perithecial cavity. Spores hyaline, allantoid. Pycnidial stage *Cytospora*.

KEY TO SOUTH AFRICAN SPECIES.

Spores 9-12 \times 2-2.5 μ	<i>V. leucostoma</i> .
Spores 12-18 \times 2.5-4 μ	<i>V. salicina</i> .

Valsa leucostoma (Pers.) Fr.

Summ. Veg. Scand. p. 411 ; Sacc. Syll. Fung. I (1882) p. 139 ; Ell. and Ev., N. Amer. Pyren. (1892) p. 485 ; Hopkins, Trans. Rhod. Sc. Ass. 35 (1938) p. 102.

Plate 4 b.

Stromata scattered irregularly, sometimes confluent, convex, pustuliform, 2-3 mm. diam., finally rupturing the periderm and becoming more or less erumpent, with only the disc protruding ; disc whitish, round to elliptic, traversed by the ostioles which appear black-shining, punctiform on the surface ; elsewhere the stroma is veiled by the closely adherent periderm.

Stroma not well developed, composed of more or less closely interwoven, branched hyphae 5-6 μ thick, sub-hyaline to fuscous, traversing the tissues of the cortex; more closely interwoven above, forming a pale, compact, erumpent disc which is traversed by the ostioles.

Perithecia 3-10 rarely up to 20 in a single stroma, globose or flattened-globose, 250-500 μ diam., narrowing suddenly above into the ostioles; ostioles more or less curved, convergent, pale yellow-brown, up to 750 μ long, not protruding or very slightly so; traversed by a pore which is lined with fine, hyaline periphyses. Perithecial wall rather light brown, 15-20 μ thick, composed of several layers of slightly compressed, thin-walled cells; becoming gradually paler within and finally giving place to a hyaline filamentous layer. Asci very numerous, filling the perithecial cavity, 8-spored, fusoid-clavate, 35-45 \times 7-8 μ , sub-sessile. Spores distichous, allantoid, hyaline, slightly curved, 9-12 \times 2-2.5 μ .

on branches of *Prunus domestica* L., Henley on Klip, Higginson, 21585.

on *Pyrus malus* L., Salisbury, Rh. 973.

The sub-genus *Leucostoma* to which this species belongs, is treated as a separate genus by von Höhnelt (9) and Wehmeyer (10). The conidial form, *Cytospora leucostoma* (Pers.) Sacc. occurs generally throughout the Union, especially in the south-west Cape, the Orange Free State and the Transvaal. It is common on branches of *Pyrus malus*, causing "Apple Die Back" (2), and is occasionally found on plum, peach and apricot branches. The ascus stage is rarely found.

I am indebted to Dr. J. C. Hopkins for a portion of the specimen in the Rhodesian Herbarium at Salisbury.

***Valsa salicina* (Pers.) Fr.**

Summ. Veg. Scand. p. 412; Sacc. Syll. Fung. I p. 131; Ell. and Ev., N. Amer. Pyr. (1892) p. 477; Kalchbrenner, Grevillea X (1882) p. 146.

Stromata thickly scattered, conical-truncate on a round base, slightly prominent, pustuliform, remaining covered by the adherent periderm, except the small, whitish disc.

Perithecia 6-12 in each stroma, arranged in a circle in the inner bark, of which the elements remain unchanged; with very short, slender ostioles emerging through the disc, round the margin or scattered through it, the entire apex barely protruding; traversed by a very narrow pore. Asci narrow-oblong or clavate, 4-8-spored, sub-sessile, 40-65 \times 7-8 μ . Spores allantoid, hyaline, slightly curved, 12-18 \times 2.5-4 μ in the 8-spored asci, 20-30 \times 5-7 μ in the 4-spored asci.

on branch of *Salix* sp., Somerset East, MacOwan 1283.

This specimen is missing from the Cryptogamic Herbarium, Pretoria, and has not been found in the Kew Herbarium or in the South African Museum, Cape Town. The description given above is taken from Ellis and Everhart (l.c.)

***Cryptosporella* Sacc.**

Syll. Fung. I (1882) p. 466.

Stromata isolated. Ectostroma forming a small conical disc. Entostroma not developed. Perithecia immersed in the unaltered bark, no marginal line present. Ascospores elliptical to fusoid, hyaline, 1-celled.

The ascus stage of *Cryptosporella* has not been observed, and only one conidial form of this genus has been recorded in South Africa.

Cryptosporella umbrina (Jenkins) Wehm.

The Genus *Diaporthe* (1933) p. 270.

Syn. *Diaporthe umbrina* Jenkins, Jour. Agric. Res. 15 (1918) pp. 593-599.

The *Phomopsis* form of this fungus, causing a stem canker of *Rosa* spp., has been recorded from Johannesburg, 30444, and from Kokstad, 30445.

Diaporthe Nitschke emend. Wehm.

Amer. Jour. Bot. 13 (1926) p. 638.

Stromata effuse or isolated. Entostromatic areas more or less differentiated and light in colour; a blackening of the sub-stratum always present, either on the surface of the substratum as a marginal zone, or as a marginal zone about the entostromatic areas. Paraphyses few and evanescent. Ascospores ellipsoid or fusoid, hyaline, 2-celled, sometimes apiculate. Imperfect stage belonging to the genus *Phomopsis*.

Certain plant diseases caused by fungi of the form genus *Phomopsis* occur in South Africa, but no ascus stage of the genus *Diaporthe* has been found.

Diaporthe citri (Fawc.) Wolf.

Jour. Agric. Res. (1926) 621-625.

is regarded by Wehmeyer (12. p. 102) as a host form of *Diaporthe Medusaea* Nits. The conidial form, *Phomopsis Citri* Fawc., occurs fairly commonly in the Union and in Rhodesia on fruit and twigs of *Citrus* spp. (2 pp. 44, 45).

Diaporthe perniciosa March.

Bull. Soc. roy. de bot. Belg. 54 (1921) is regarded by Wehmeyer (12 p. 89) as a host form of *Diaporthe eres* Nits. The *Phomopsis* stage has been observed in Rhodesia (4 p. 101) on twigs of *Pyrus malus*.

Valsaria Ces. et de Not. pro parte.

Schema sferiacei ital. (1863) p. 205; emend Wehm.

Amer. Jour. Bot. 13 (1926) p. 640.

Stromata isolated or confluent. Entostroma very strongly developed, often erumpent, bounded by a dark, marginal zone, usually coloured. Paraphyses numerous and persistent. Ascospores uniseriate, elliptic-fusoid, 2-celled, brown.

KEY TO SOUTH AFRICAN SPECIES.

Spores cylindrical, not constricted.....	<i>V. Eucalypti</i> .
Spores fusoid, constricted.....	<i>V. natalensis</i> .

Valsaria Eucalypti (Kalch. et. Cke.) Sacc.

Syll. Fung. I (1882) p. 746.

Syn. *Melogramma Eucalypti* Kalch. et Cke., Grevillea IX (1880) p. 31.

Plate 15 c.

Stromata developing in the bark, erumpent and early becoming superficial, attached only at the base, pulvinate, cinnamon brown; at first small, round to elliptic, up to 2 mm. diam.; developing in groups, becoming confluent and fusing to form large irregular stromatic cushions up to 2 cm. long and 5 mm. broad; surface of stroma somewhat rugulose, and seamed with irregular fissures.

Stroma diatrypoid ; ground tissue consisting of a pale to light brown fungous tissue, formed of more or less closely interwoven hyphae $2.5-3.5\ \mu$ thick. This becomes gradually more compact towards the surface, where it is dark cinnamon brown, sub-opaque, parenchymatous, composed of rather thin-walled, angular cells, $3-5\ \mu$ diam.

Perithecia 2-6 in each individual stroma, monostichous, often rather distant from one another, globose to ovate, only slightly flat-sided through mutual pressure ; or arranged irregularly, closely crowded and irregular in shape ; $170-275\ \mu$ diam., narrowing suddenly or rather gradually above into cylindrical ostioles ca. $150\ \mu$ long (total height of perithecia including ostiole $350-500\ \mu$) ; ostioles not sharply differentiated from the tissue of the stroma, not protruding ; traversed by a pore ca. $55\ \mu$ broad, lined with hyaline periphyses. Perithecial wall dark brown, membranous, ca. $10-12\ \mu$ thick, composed of a few layers of somewhat compressed cells ; not very sharply defined, more or less continuous outwardly with the tissue of the stroma, and giving place within to a sub-hyaline, concentric, filamentous layer. Asci fairly numerous, 8-spored, cylindrical, rounded above, tapering slightly at the base to a short club-shaped or peg-like foot, $80-100 \times 11-12.5\ \mu$. Paraphyses rather numerous, hyaline, filamentous. Spores obliquely monostichous, dark brown, oblong, ellipsoid, broadly rounded at both ends, 1-septate, not constricted, $12.5-18 \times 6-8\ \mu$, mostly $15 \times 7-7.5\ \mu$; loculi about equal ; episore minutely verrucose at maturity.

on bark from trunks of *Eucalyptus globulus* Lab., Somerset East, MacOwan 1179, (S.A.M. 33848).

I am indebted to the Director of the South African Museum for the loan of this specimen.

***Valsaria natalensis* Doidge nov. sp.**

Plate 15 c.

Stromata scattered unevenly over the whole surface of the stem, sometimes single, more frequently more or less confluent, or fused in small or larger groups, quite immersed in the cortex with only the ostioles punctiform-erumpent, or pushing up the periderm into raised pustules and rupturing it irregularly ; single stromata irregularly circular in outline, up to 1 mm. diam.

The lower part of the stroma consists of a filamentous fungous tissue, formed of tortuous, more or less closely interwoven, sub-hyaline to pale yellow-brown hyphae, up to $2.5\ \mu$ thick, amongst which the unaltered or slightly altered cells of the host can be seen ; this is bounded below and at the sides by a thin blackish-brown line ; above there is a firm, pale yellow-brown, more closely compact tissue, forming a disc traversed by the ostioles ; becoming dark brown, parenchymatous at the surface, where it is composed of irregularly round, more or less angular cells ca. $5-6\ \mu$ diam. ; the torn periderm adheres firmly to the sides of the stroma.

Perithecia sometimes single, sometimes 2-4 or more in a single stroma, placed in an irregular circle or quite irregularly, monostichous, globose to ovate, or becoming irregular through lateral pressure. $200-450\ \mu$ diam., rather deeply immersed, narrowing suddenly above into the ostioles. Ostioles mostly straight, parallel, rarely more or less convergent, sub-cylindrical or tapering somewhat upwards, $250-350\ \mu$ long, $75-100\ \mu$ broad, with entire margin, not protruding from the stroma ; traversed by a pore, which is sometimes more or less cylindrical, but more frequently narrow-conical, lined with rather sparse, very fine, hyaline, ascending periphyses. Perithecial wall mostly about $25-30\ \mu$ thick, composed of several layers of compressed cells, which are usually yellow-brown at the base and sides, becoming darker above, and opaque, blackish-brown in the ostioles ; not sharply defined outwardly, where it is continuous with the tissue of the stroma ; giving place suddenly within to a concentric, hyaline, filamentous layer. Asci very numerous, 8-spored, clavate, rounded above, tapering below into a long, slender, hyaline stalk, which is quite filamentous at the base, total length $100-150\ \mu$ sp. part $50-72.5 \times 11-12.5\ \mu$. Spores distichous, brown, fusoid or ellipsoid, 1-septate, constricted, usually tapering more or less to the bluntly conical

or rounded ends, $12.5-16 \times 5.5-6.5 \mu$; cells usually equal or sub-equal, but sometimes the upper is slightly shorter and broader than the lower. Paraphyses numerous, hyaline, filiform, about 1μ thick.

on dead branches of *Solanum auriculatum* Ait., Xumeni Forest, near Donnybrook, Natal, *Morgan* and *Doidge*, 28931, 30373.

Pseudothis Theiss. et Syd.

Ann. Myc. 12 (1914) p. 274, and 16 (1918) p. 180.

Stromata foliicolous, seated on the unaltered palisade cells, at first covered by a black-shining, epidermal clypeus, later rupturing and throwing off the epidermis, and becoming rough, brown, conspicuous and apparently superficial. Stroma reddish brown, verruciform. Perithecia immersed, globulose, with light brown to pale walls and periphysate ostioles. Asci paraphysate, cylindrical-clavate, 8-spored. Spores brown, unequally 2-celled.

Pseudothis Pterocarpi Syd.

Ann. Myc. 13 (1915) p. 339; Petrak, Ann. Myc. 27 (1929) p. 330.

Syn. *Systremma Pterocarpi* Doidge, Bothalia 1 (1922) p. 70.

Dothidea Pterocarpi Syd., Phil. Jour. Sci. VIII (1913) p. 280.

Plate 15 c.

Stromata epiphyllous, rarely hypophyllous, on yellowish leaf spots, developing under the epidermis and becoming erumpent, scattered, round, pulvinate, black, rugulose, $0.5-1.5$ mm. diam.; usually with a concentric zone of secondary stromata surrounding the primary stroma. Stromata may also occur on twigs and midribs; these are similar to those on the leaves but are usually oval to ellipsoid and solitary.

Tissue of stroma rather loosely parenchymatous in structure, composed of light brown to blackish-brown, round to angular, thin-walled cells, mostly $5-10 \mu$ diam.; ground tissue between the perithecia paler; often becoming more firmly compacted at the surface, and forming a darker, sub-opaque crust, which is interrupted by the paler ostioles of the perithecia.

Perithecia 1-5 in a single stroma, flattened globose or ovate, deeply immersed, $120-250 \mu$ diam., narrowing suddenly above into the ostioles. Ostioles up to 150μ long, cylindrical to narrow funnel-shaped, not sharply differentiated from the stroma but ca. $45-50 \mu$ broad, widening at the apex to 75μ , not protruding or very slightly so, apex of ostiole pale, almost sub-hyaline; traversed by a pore lined with hyaline paraphyses; Perithecial wall consisting of several layers of pale, rather thin-walled, somewhat compressed cells. Asci numerous, 8-spored, cylindrical-clavate, broadly rounded above, $48-70 \times 10-16 \mu$. Spores distichous, brown, oblong, $10-13 \times 5-7 \mu$, unequally 1-septate; upper loculus $6-8.6$, lower $3.3-5 \mu$ long.

on leaves and stems of *Pterocarpus rotundifolius* (Sond.) Druce, Khami Ruins, S. Rhodesia, *Bottomley*, 14101.

Petrak (l.c.) pointed out that the South African fungus is identical with the species originally described by Sydow as *Dothidea Pterocarpi* from the Philippines.

Holstiella P. Henn.

Pilze Ostafrikas (1895) p. 33.

Stromata superficial, pulvinate or hemispherical; ostioles at first conical, acute, then depressed or concave; perithecia numerous, immersed. Asci clavate, pedicellate, 8-spored, paraphysate. Spores fusoid or clavate, multi-septate, more or less constricted at the septa, hyaline, with a mucous sheath.

Holstiella usambarensis P. Henn.-forma.

Pilz. Ostaf. p. 33; Sacc. Syll. Fung. XIV, p. 594; Syd., Ann. Myc. 24 (1926) p. 271.

Stromata rather closely and evenly scattered over large areas of the bark, discrete, or in short uneven rows and then becoming more or less confluent and fused; round, elongated or irregular in outline and apparently quite superficial, about 1–2 mm. diam., convex, pulvinate, with grey-brown or blackish-brown surface roughened by the punctiform-erumpent ostioles. Stroma developing in the outer layers of the cortex, which is normally about 30 μ thick and becomes thickened to about 800 μ .

Stroma flat at the base and not sharply defined; ground tissue parenchymatous, including in places shrunken vestiges of the host tissues, composed of rather small, thick-walled, angular cells; the cells are sometimes translucent, light yellowish-brown, and sometimes, especially at the surface, darker, blackish-brown or olive brown.

Perithecia numerous, monostichous, closely crowded or comparatively distant, broadly ovate or ellipsoid, 200–400 μ diam., up to 800 μ high, including the ostioles, gradually narrowed above into the ostioles. Ostioles broadly conical and truncate, about 200 μ long and 150 μ broad, punctiform erumpent, but not protruding; lined with copious periphyses. Perithecial wall carbonaceous, very variable in thickness, sometimes only 10–15 μ thick, sometimes up to 40 μ , opaque, blackish-brown, composed of small cells; at the tips of the ostioles, the cells are yellow-brown or sometimes quite hyaline. Asci numerous, broadly clavate, broadly rounded above, tapering more or less downwards, sessile or with a short thick foot, 8-spored, sp. part 95–100 \times 18–22 μ , thick-walled, slightly thickened at the apex. Spores distichous or incompletely trichothous, fusiform, tapering to blunt ends, straight or slightly bent, hyaline, 7–9-septate, not constricted, 35–42 μ long, 8–10 μ broad, not including the mucilaginous envelope which is about 2.5 μ thick; central cells narrow ellipsoid, 3.5–5 μ long, becoming shorter towards the ends; terminal cells short, conical. Paraphyses very numerous, coarsely filamentous, freely branched, about 1 μ thick.

on bark, Lourenco Marques, Junod, 12206.

The type was described by Hennings on branches of a tropical African tree. The fungus described above is considered by Sydow (loc. cit.) to be a form of *Holstiella usambarensis*, from which it differs in the size of the spores; they are smaller and have fewer septations; no other differences were observed. In Hennings' type, spores are seen with 11–14 septa and up to 55 μ long.

Calospora Sacc.

Syll. Fung. II (1883) p. 231.

Stromata immersed in the cortex, valsoid, pustulate. Asci typically 8-spored, paraphysate. Spores oblong or fusoid, 2-pluri-septate, hyaline.

Calospora Bottomleyae Doidge, nov. sp.

Stromata scattered, or in irregular, elongated groups, developing in the cortex, pushing up the periderm and becoming erumpent, dull black, only slightly convex, elliptic, up to 1.5 mm. long. The cortical tissues finally break away, leaving the stroma exposed and attached at the base to the wood of the host.

Inner part of stroma consisting of more or less closely interwoven hyphae, permeating the cortical cells of the host; fungous tissue sub-hyaline to pale yellow-brown, formed of hyphae 3–4 μ thick; the cells of the host are not altered or very slightly so. The fungous tissue is darker and more closely interwoven near the surface, forming a dark brown, sub-opaque crust 25–35 μ thick; the dark zone is somewhat thinner and less dense at the sides and at the base where it rests on the wood.

Perithecia 1–5 in a single stroma, distant, solitary, or arranged in a line or irregular circle, globose or globose-depressed, 180–280 μ diam., 150–200 μ high, narrowing suddenly

above into the ostioles. Perithecial wall, firm, membranous, 12–20 μ thick; dark brown and well defined at the base where it is about 15 μ thick; elsewhere more or less continuous with the stroma outwardly, and going over gradually into a hyaline, filamentous layer within; composed of rather thin-walled, angular, slightly compressed cells up to 15 μ long and ca. 5 μ thick. Ostioles cylindrical or narrow funnel-shaped, straight in the solitary perithecia, converging when the perithecia are in groups, 100–150 μ long, 70–100 μ broad, pale yellow-brown, protruding very slightly from the stroma, entire; traversed by a pore which is lined with hyaline periphyses. Asci 8-spored, oblong-clavate to oblong, rounded above, narrowing gradually or rather suddenly below into a short foot, 35–50 \times 8–10 μ . Spores distichous, hyaline, 3-septate, oblong to sub-fusoid, usually tapering somewhat to the rounded ends, 10–12 \times 2.5–3 μ : constricted more or less at the middle septum and separating readily into two segments.

on stems of plant undet., Trigaartspoort, Pretoria Distr., *Bottomley* and *Doidge*, 31074.

***Calospora aurasiaca* (Fahr.) Sacc.**

The fungus recorded as this species on oak branches, (2, p. 41) is *Pseudovalsa longipes* (Tul.) Sacc., see *Bothalia* 4 (1941) p.

LATIN DIAGNOSES OF NEW SPECIES.

***Calospora Bottomleyae* Doidge nov. sp.**

Stromata sparsa v. in greges elongatos irregulares laxè disposita, primitus in corticem immersa, dein erumpentia atra, leniter convexa, ambitu elliptica, usque 1.5 mm. longa: inferne pro maxima parte tantum e reliquis substrati parum mutatis constantia, superne crusta atro-brunnea sat carbonacea ostiolis pertusa praedita. Perithecia 1–5 in quoque stromate, solitaria v. laxè lineare v. circinatim ordinata, globosa, plus minus depressa, 180–280 μ diam., 150–200 μ alta, superne in ostiola vix prominula subito attenuata; pariete ca. 12–20 μ crasso, e pluribus stratis cellularum leniter compressarum usque 15 μ long. et 5 μ lat. pellucide brunnearum composito. Asci octospori, oblongo-clavati, antice rotundati, breviter pedicellati, 35–50 \times 8–10 μ . Sporae distichae, hyalinae, 3-septatae, oblongae v. sub-fusoidae, ad septum primarium medium constrictae, utrinque obtusae, 10–12 \times 2.5–3 μ .

Hab. in caulibus ignotis, Trigaartspoort, leg. *Bottomley* et *Doidge*, 31074.

***Diatrype auristroma* Doidge nov. sp.**

Stromata plerumque aggregata, primitus peridermio tecta deinde peridermio deciduo plus minus libera, ambitu orbicularia vel elliptica, pulvinata, 1–6 mm. longa, 1–1.5 mm. lata, ad superficiem atro-brunnea parenchymatice e cellulis 3–5 μ metientibus composita, intus aurea ad auranteo-brunnea. Perithecia omnino immersa, 5–30 in quoque stromate, conferta, monosticha v. irregulariter sub-disticha, ovata v. e mutua pressione irregularia, 450–900 μ alta, 220–450 μ lata, superne in ostiola crassa vix prominula 120–180 μ longa attenuata; pariete 10–12 μ crasso, obscure brunneo, e pluribus stratis cellularum 10–12 μ metientibus composito. Asci numerosi, octospori, clavati, antice rotundati et leniter incrassati, postice in stipitem tenuem longum hyalinum gracilem attenuati, p. sp. 30–36 \times 5–6 μ . Sporae distichae, allantoidaeae, utrinque rotundati, sub-hyalinae, in cumulo ochraceae, 6–8.5 \times 1.5–1.75 μ .

Hab. in ramulis emortuis *Xymalos monosporae* Baill., in silvis Marwaqa prope Bulwer, leg. *Morgan* et *Doidge*, 31073.

Diatrype conferta Doidge nov. sp.

Stromata sparsa v. aggregata, primitus peridermio tecta, mox erumpentia, atra, carbonacea, crasse verruciformia vel pulvinata, ambitu rotundata v. elliptica, 1–3 mm. diam., tunc haud raro in greges parvos connata et confluentia; crusta exterior 30–90 μ crassa atra opaca, e cellulis atro-brunneis ca. 2·5–4 μ metientibus composita, intus sub crustam strato albo praedita, sub peritheciis luteo-brunnea. Perithecia numerosa (usque 30) in quoque stromate, conferta, disticha v. monosticha, ovata v. e mutua pressione irregularia, 250–400 μ diam., usque 550 μ alta, superne in ostiola vix vel distincte prominula 150–300 μ longa attenuata; pariete sub-opace atro-brunneo, 18–30 μ crasso, e pluribus stratis cellularum compressarum composito. Asci numerosissimi clavati octospori, antice rotundati et leniter incrassati, postice in stipitem longum gracilem attenuati, p. sp. 40–50 \times 7·5–8 μ . Sporae distichae, allantoideae, sub-hyalinae in cumulo pallide flavo-brunneolae, 10–15 \times 2·5–3 μ .

Hab. in ramis emortuis ignotis, in silvis Xuneni prope Donnybrook, leg. Morgan et Doidge, 30420.

Diatrype Doryalidis Doidge nov. sp.

Stromata sparsa vel plus minus aggregata, primitus in cortice immersa dein plus minus erumpentia, strata exterior elevantia et disrumpentia laciniis ejus pro parte tecta, ambitu rotundata vel elliptica, 0·5–1 mm. diam.; crusta exterior 30–75 μ crassa, atro-brunnea subopaca, carbonacea, e cellulis 2·5–5 μ diam. composita. Perithecia plerumque 2–6 in quoque stromate, monosticha, saepe circulariter disposita, ovata v. oblonga, e mutua pressione saepe applanata, 300–450 μ diam., 450–500 μ alta, superne in ostiola cylindracea prominula 300–400 μ longa attenuata; pariete 20–35 μ crasso atro-brunneo, e pluribus stratis cellularum 2·5–5 μ metientibus composito. Asci numerosi octospori clavati, p. sp. 30–40 \times 5–6 μ , antice rotundati, postice in stipitem longum gracilem attenuati. Sporae distichae allantoideae continuae singulae sub-hyalinae, in cumulo flavo-brunneolae, 6–8 \times 1·75–2 μ .

Hab. in ramulis *Doryalidis rhamnoidis* (Burch.) Harv. in silvis, Knysna, leg. Bottomley, 31060.

Diatrype Leonotidis Doidge nov. sp.

Stromata sat equaliter per caulem sparsa, subinde gregaria, primitus in cortice immersa, dein plus minus erumpentia, strata exterior elevantia et disrumpentia laciniis ejus pro parte tecta, lateraliter firme cum peridermio connata, atra, pulvinata vel verruciformis, ambitu rotundata vel leniter elongata, 1–2·5 mm. diam.; crusta exterior ca. 50 μ crassa, carbonacea, e cellulis atro-brunneis 3·5–5 μ metientibus composita. Perithecia plerumque 3–5 vel usque 8 in quoque stromate, circulariter v. plus minus irregulariter disposita, globosa v. ovata, e mutua pressione saepe applanata, 300–400 μ diam., superne subito in ostiola crasse cylindracea haud vel vix prominula attenuata; pariete ca. 12–15 μ crasso e pluribus stratis cellularum compressarum composito. Asci numerosissimi 8-spori, clavati, p. sp. fusiformi 35–45 \times 6–8 μ , antice rotundati, postice in stipitem longum gracilem attenuati. Sporae distichae, allantoideae, continuae, pallide flavo-brunneolae, leniter curvatae, 10–12·5 \times 2–2·5 μ . Paraphyses hyalinae, filiformes.

Hab. in caulibus *Leonotidis* sp., Hlabini, Polela distr., leg. Doidge, 29821.

Diatrype xumenensis Doidge nov. sp.

Stromata longe lateque irregulariter sparsa, interdum solitaria sed plerumque plus minus aggregata, saepe lineas breviores vel longiores parallelas formantia, primitus peridermio tecta et tantum ad verticem per rimas erumpentia, deinde peridermio deciduo fere omnino libera, ambitu orbicularia vel elliptica, crasse verruciformia vel pulvinata, ca. 1 mm. diam., subinde omnino confluentia et tunc majora; ad superficiem opace atra vel atro-

brunnea carbonacea, parenchymatice e cellulis atro-brunneis ca. $5-8\ \mu$ metientibus composita. Perithecia omnino immersa, 2-8 in quoque stromate, monosticha, ovata, e mutua pressione saepe applanata et irregularia, $200-450\ \mu$ diam., $450-550\ \mu$ alta, superne in ostiola cylindracea plerumque leniter prominula fasciculatim conjuncta, indivisa vel tenuiter sulcata, attenuata: pariete ca. $16-25\ \mu$ crasso, e pluribus stratis cellularum fere opace atro-brunnearum composito. Asci numerosissimi octospori, clavati, p. sp. ellipsoidei v. parum fusoides, $40-45 \times 5.5-6.5\ \mu$, antice rotundati, postice in stipitem tenuem longiusculum attenuati. Sporae distichae vel incomplete trichichae cylindraceae utrinque rotundatae, allantoideae curvatae continuae, sub-hyalinae in cumulo luteo-brunneolae, $6-10 \times 2-2.5\ \mu$.

Hab. in ramis emortuis in silvis Xumeni, prope Donnybrook, leg. Morgan et Doidge, 28919.

***Diatrypella Morganae* Doidge nov. sp.**

Stromata longe lateque irregulariter sparsa, plerumque solitaria, interdum in greges minutos crescentia, ambitu plus minus rotundata, pulvinata, $1-2.5\ \text{mm.}$ diam., semper peridermio tecta et tantum cum ostiolis erumpentia; contextu stromati intramatrix parcesime evoluto, pro maxima parte e substrati partibus plus minus mutatis et cellulis minutis sub-hyalinis vel dilute flavo-brunneolis constante. Perithecia monosticha 3-7 in quoque stromate, omnino immersa, globosa v. ovata, sive laxe stipata sive plus minus dense aggregata e mutua pressione applanata, $250-500\ \mu$ diam., superne subito in ostiola crasse cylindracea convergentia, $150-200\ \mu$ crassa, plerumque leniter prominula, ad marginem subinde tenuiter sulcata et nitidula attenuata; pariete inferne et ad latera $20-30\ \mu$ crasso, e pluribus stratis cellularum compressarum pellucide atro-brunnearum ca. $10-15\ \mu$ metientibus composito. Asci numerosi polyspori, cylindracei vel clavati, subsessiles v. breviter stipitati, $100-125 \times 12-15\ \mu$. Sporae allantoideae continuae, utrinque rotundatae, pallide luteo-brunneolae, in cumulo fere rufo-brunneae, $10-16 \times 2.5-4\ \mu$.

Hab. in ramis emortuis, Hlabini, Polela distr., leg. Morgan et Doidge, 29820.

***Diatrypella natalensis* Doidge nov. sp.**

Stromata sive irregulariter sparsa, sive in greges minutos v. majores vel in lineas breviores saepe densos crescentia, ambitu plus minus rotundata, usque $1\ \text{mm.}$ diam., vel elliptici ca. $3 \times 1\ \text{mm.}$, primitus peridermio tecta, deinde plus minus libera, atra, convexa, pulvinata; ad superficiem opace atra, carbonacea, parenchymatice e cellulis pellucide atro-brunneis $6-8\ \mu$ metientibus composita. Perithecia 7-15 in quoque stromate, omnino immersa, globosa v. ovata, e mutua pressione saepe irregularia, $250-400\ \mu$ diam., $300-500\ \mu$ alta, superne in ostiola breviuscula crasse cylindracea leniter prominula ad marginem 3-5-sulcata et nitidula attenuata; pariete obscure brunneo $12.5-25\ \mu$ crasso, e pluribus stratis cellularum fortiter compressarum composito. Asci numerosi, polyspori, clavati, recti v. curvati, ad apicem rotundati, postice in stipitem gracilem hyalinem attenuati, p. sp. $80-100 \times 12.5-15\ \mu$. Sporae allantoideae continuae, plus minus curvatae, utrinque rotundatae, sub-hyalinae, in cumulo luteo-brunneolae, $5-7.5 \times 1.1-2\ \mu$. Paraphyses non visae.

in caulibus *Citri nobilis* Lour., Umfwalumi, Natal, leg. Wayne, 21006.

***Diatrypella pretoriensis* Doidge nov. sp.**

Stromata in greges majores irregulares densiore crescentia, plerumque discretata, ambitu plus minus rotundata, usque $1\ \text{mm.}$ diam., primitus peridermio tecta deinde erumpentia, plus minus convexa pulvinata; crusta exteriore $50-60\ \mu$ crassa, nonnunquam usque $75\ \mu$, atra, carbonacea. Perithecia 2-12 in quoque stromate, monosticha, per ratione laxe stipata, ideoque sat regulariter globosa v. ovata, $400-500\ \mu$ diam., superne in ostiola breviter cylindracea vix prominula subito attentuata; pariete atro-brunneo sub-opaco, e stratis

pluribus cellularum compressarum ca. 4-6 μ metientium composito. Asci numerosi, polyspori, sporis minutis dense stipati, antice rotundati, postice in stipitem gracilem attenuati, p. sp. 40-60 \times 10-12.5 μ . Sporae allantoideae, sub-hyalinae, in cumulo pallide luteo-brunneolae, 2.5-4 \times 1 μ , rarius usque 5 μ longae.

Hab. in radicibus *Populi* sp., De Beers Rust, prope Pretoria, leg. Doidge, 31072.

Eutypella Acaciae Doidge nov. sp.

Stromata in cortice late effusa, usque ad 8 cm. longa et 2 cm. lata, circa acervulos vix elevata, fere tantum cum ostiolis fasciculatim coalitis per corticis rimas erumpentia; inferne pro maxima parte tantum e reliquis substrati parum vel leniter mutatis constantia, superne crusta carbonacea opace atro-brunnea ostiolis pertusa praedita. Perithecia monosticha, plerumque 1-5 aggregata, globosa v. ovata, e mutua pressione saepe leniter applanata, 330-550 μ diam., 400-520 μ alta, superne subito in ostiola crasse cylindracea plerumque fasciculatim conjuncta et connata sulcis 3-5 tenuibus praedita attenuata; pariete opace atro-brunneo, inferne et ad latera ca. 20 μ crasso, e pluribus stratis cellularum composito. Asci numerosissimi, clavati, 8-spori, p. sp. ellipsoidea vel fusioidea 35-40 \times 6-6.5 μ , antice rotundati, postice in stipitem longum gracilem attenuati. Sporae distichae v. sub-tristichae, pallide olivaceae, continuae allantoideae utrinque rotundatae, plus minus curvatae, 8-15 \times 2-2.5 μ .

Hab. in ramis emortuis *Acaciae atarucanthae* D.C., Kromrivier, Rustenburg distr., leg. Doidge et Bottomley, 30476.

Eutypella Lycii Doidge nov. sp.

Stromata sparsa vel in series irregulares disposita, minuta, atra, e basi circulari conico-truncata, in cortice immersa ostiolis tantum prominulis, lateraliter firme cum peridermio connata, usque ad 1.5 mm. diam.: inferne pro maxima parte tantum e reliquis substrati parum mutatis constantia, superne crusta sat carbonacea ostiolis pertusa, parenchymatice e cellulis fere opace atro-brunneis 4-6 μ metientibus praedita. Perithecia monosticha, 1-7 raro 8-13 in quoque stromate, circulariter disposita, globosa v. ovata e mutua pressione interdum leniter applanata, 350-450 μ diam. 400-475 μ alta, superne subito in ostiola sub-cylindracea curvata sulcis 3-5 praedita attenuata: pariete inferne et ad latera ca. 25 μ crasso, e pluribus stratis cellularum compressarum pellucide atro-brunnearum composito. Asci numerosissimi, 8-spori, clavati v. sub-fusiformi, 35-40 μ longi, p. sp. 25-28 \times 3.75-5 μ , antice rotundati postice in stipitem gracilem attenuati. Sporae distichae allantoideae continuae utrinque rotundatae, sub-hyalinae in cumulo pallide olivaceae, 5-6.5 \times 1 μ .

Hab. in ramulis *Lycii echinati* Dun., Aliwal North, leg. Pienaar, 2094.

Valsaria natalensis Doidge nov. sp.

Stromata longe lateque irregulariter sparsa, numerosissima et magnam ramorum partem obtegentia, solitaria irregulariter circularia usque 1 mm. diam. vel in greges irregulares crescentia, tunc haud raro connata et confluentia, immersa v. pustulatim erumpentia, lateriliter firme cum laciniis peridermii connata: inferne et ad latera pro maxima parte tantum e reliquis substrati parum vel leniter mutatis constantia, superne parenchymatice e cellulis pellucide brunneis 5-6 μ metientibus composita. Perithecia monosticha, in stromate omnino immersa plerumque 1-4 in quoque stromate, globosa vel late ovata vel e mutua pressione irregularia, 200-450 μ diam., superne in ostiola cylindracea v. anguste conica 75-100 μ lata attenuata: pariete inferne et ad latera ca. 25-30 μ crasso, e pluribus stratis cellularum valde compressarum pellucide brunnearum composito, intus subito in stratum hyalinum concentricum fibrosum transeunte. Asci numerosi clavati, antice rotundati, postice in stipitem longum gracilem ad basim filamentosum attenuati, in toto 100-150 μ longi, p. sp. 50-72.5 \times 11-12.5 μ . Sporae distichae, brunneae, 1-septatae,

fusoideae vel ellipsoideae, ad septum constrictae utrinque obtuse conicae v. rotundatae, $12.5-16 \times 5.5-6.6 \mu$, cellulis ut plurimum aequalibus vel subaequalibus, subinde autem superiore paullo brevioribus sed latioribus. Paraphyses numerosae, hyalinae, filiformes, ca. 1μ crasso.

Hab. in ramis emortuis *Solani auriculati* Ait., in silvis Xumeni, prope Donnybrook. leg. Morgan et Doidge 28931, 30373.

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EXPLANATION OF PLATES.

Except the reproduction of Berlese's drawings, Plates 4-15 are photographs of sections through the stromata of the species indicated; the magnification is the same in each case, $\times 224$.

- Plate 1.—*Calosphaera princeps* Tul. a. Perithecia on bark of *Prunus armeniaca* a. ($\times 7$); b. detail from a. ($\times 14$).
- Plate 2.—a. *Diatrype auristroma*, stromata on bark; b. *Diatrype xumenensis*. Both ($\times 7$).
- Plate 3.—a. *Diatrypella Agaves*, stromata on stem; b. *Diatrype caulina*; c. *Peroneutypella cylindrica*, the ostioles of the perithecia and the sterile emergences can be detected; all ($\times 7$).
- Plate 4.—a. *Erostella quaternarioides* from Berlese's drawing; b. *Valsa leucostoma*.
- Plate 5.—*Peroneutypella cylindrica*, a. from collection 28918; b. from 30164.
- Plate 6.—a, b. *Peroneutypella infinitissima*, from type collection; c. *Eutypella Acaciae*.
- Plate 7.—a. *Eutypella Lycii*; b, c. *Eutypella stellulata*, b. Medley Wood's collection; c. from Rhodesian material; d, e. *Eutypella citricola*; d. material from Philippines; e. from Natal collection.
- Plate 8.—a. *Eutypella MacOwanii*; b, c. *Eu. Doidgeae*; b. from type collection 30378.
- Plate 9.—a. *Diatrype Dorylidiis*; b. *D. xumenensis*; c. *D. caulina*; d. *D. Leonotidis*.
- Plate 10.—*Diatrype MacOwaniana*, a. from Berlese's drawing of *D. Bona-spei*; b. from MacOwan 1264.
- Plate 11.—*Diatrype auristroma*, a. stroma with contracted, sterile base; b. stroma with extended base.
- Plate 12.—*Diatrype caminata*, a. from Berlese's drawing; b. from recent collection.
- Plate 13.—a, b. *Diatrype conferta*; c. *Diatrypella Morganae*.
- Plate 14.—a. *Diatrypella oligostroma*; b. *D. Agaves*; c. *D. natalensis*.
- Plate 15.—a, b. *Diatrypella pretoriensis*; c. *Pseudothia Pterocarpi*; d. *Valsaria Eucalypti*; e. *Valsaria natalensis*.

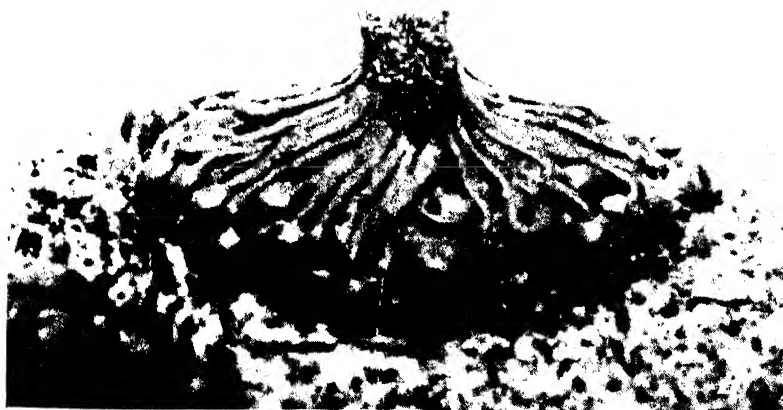


PLATE I.
Calosphaeria princeps.



PLATE 2.

*A. Diatrype auristroma.**B. Diatrype xumenensis.*

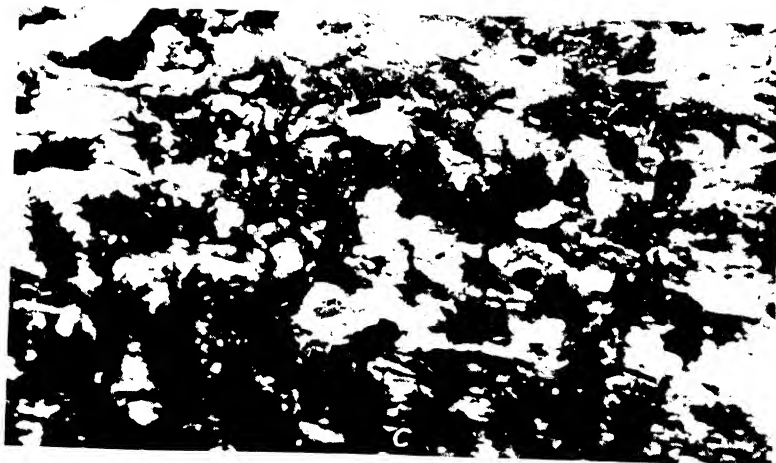
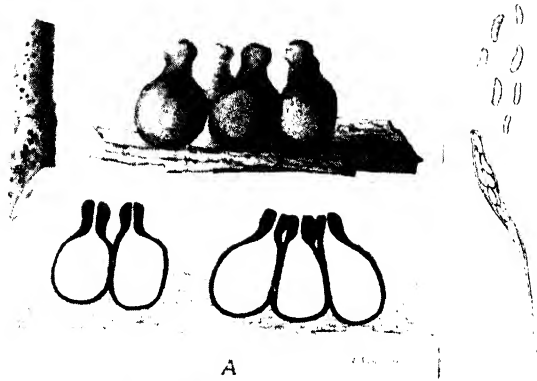


PLATE 3.



TORMINIA QUATERNARIOIDES

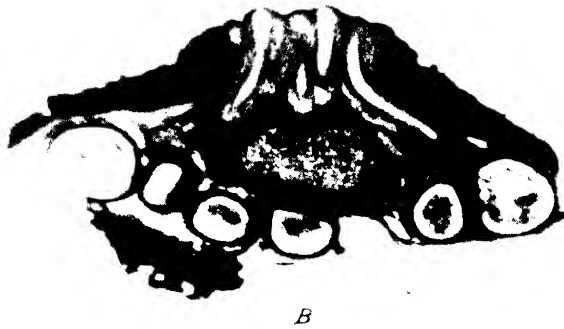
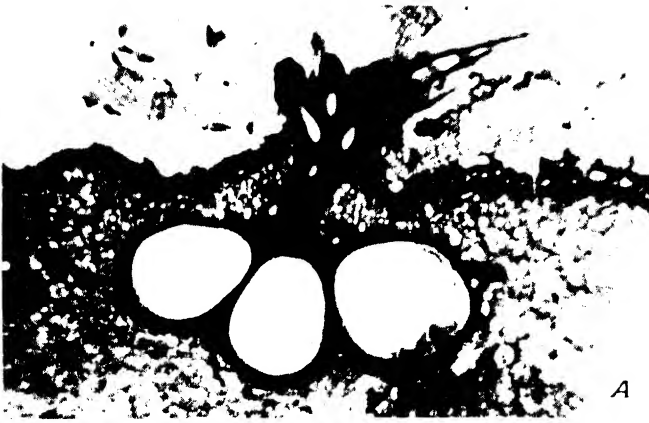


PLATE 4.

A. *Torminia quaternarioides*.B. *Valsa leucostoma*.



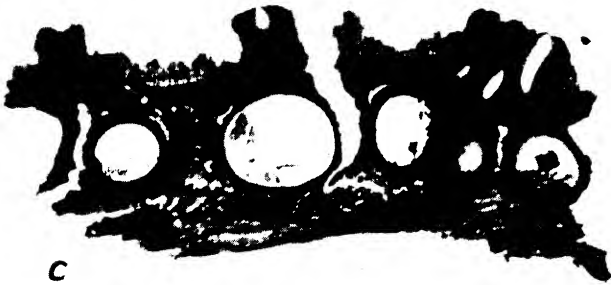
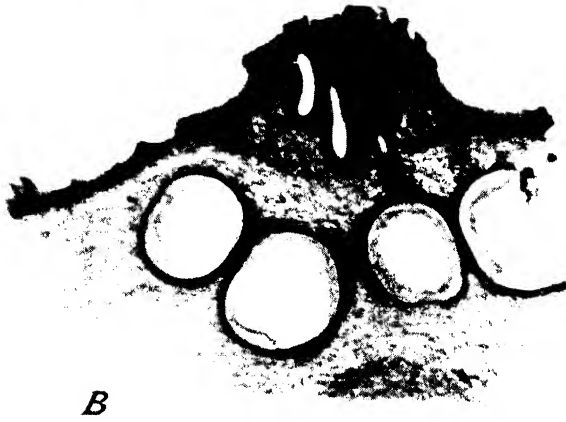
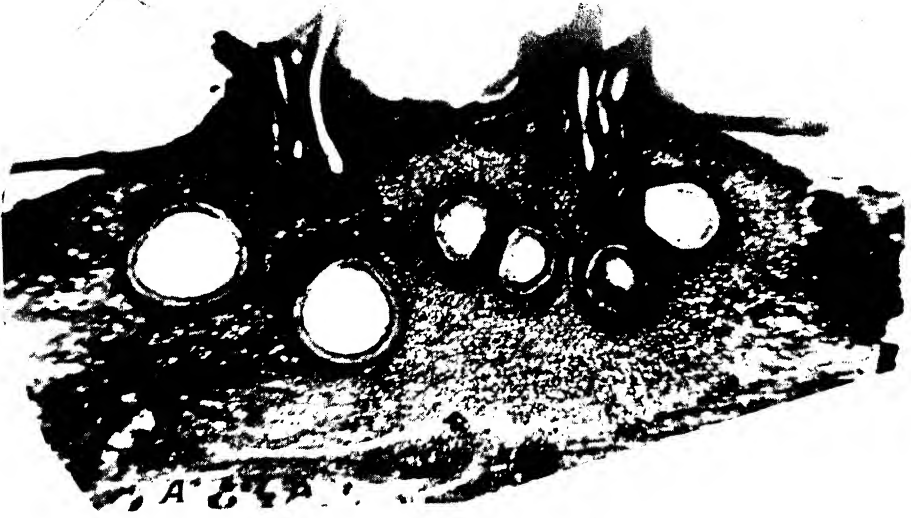
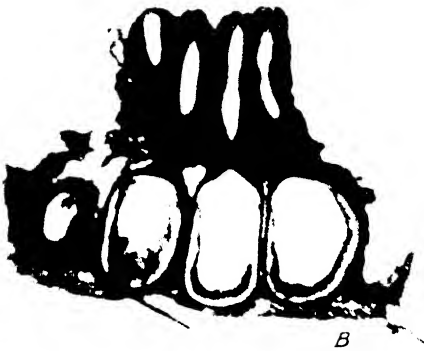


PLATE 6.

A., B. Peronotyphella infinitissima.
C., D. Eutypa transvaalensis.



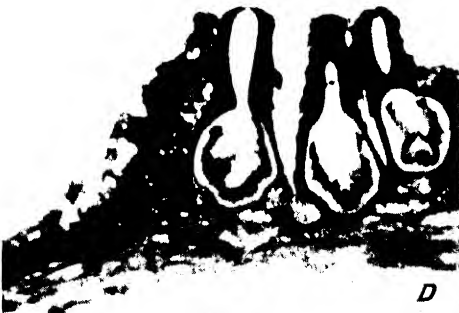
A



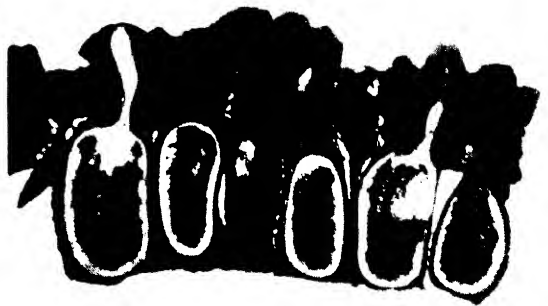
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C



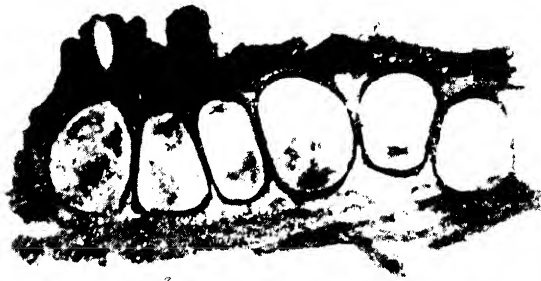
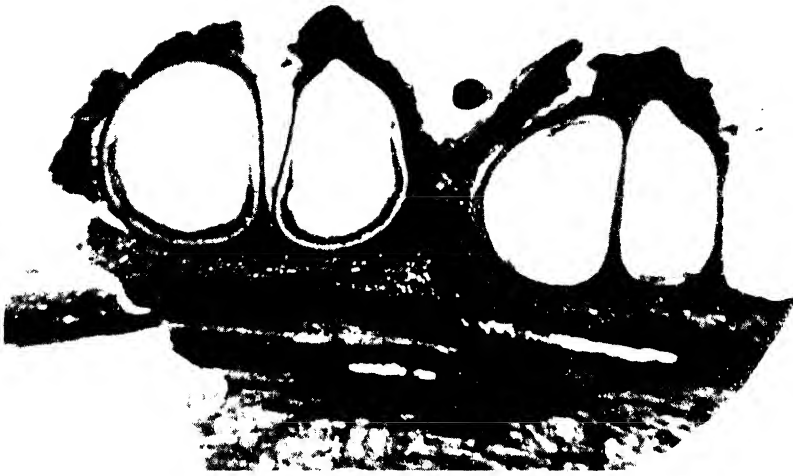
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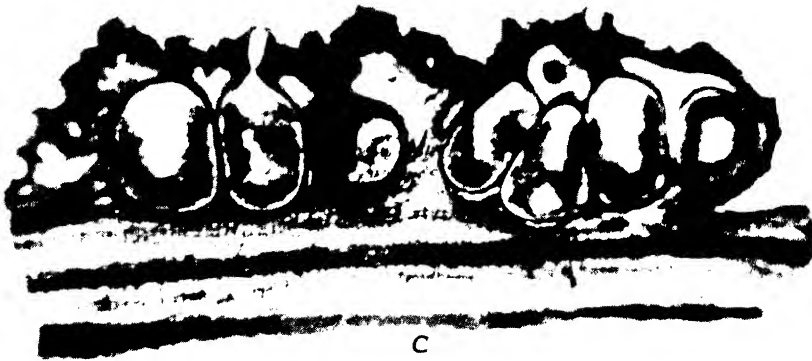
E

PLATE 7.

A. *Eutypella lycii*. B., C. *Eutypella stellulata*. D., E. *Eutypella citricola*.



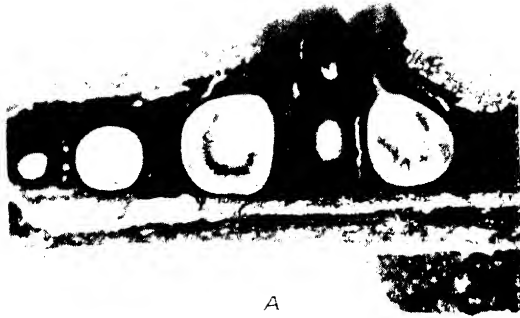
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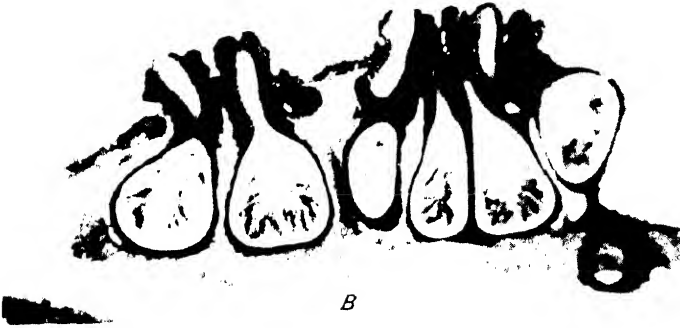
C

PLATE 8.

A. *Eutypella MacOwani*. B., C. *Eutypella Doidgea*.



A



B



C



D

PLATE 9.

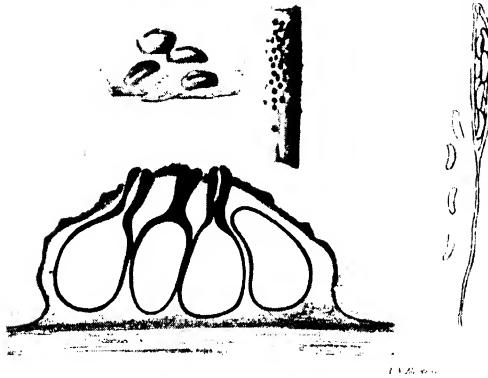
A. *Diatrypa Doryfoliis*.
C., *D. caulinea*.

B. *Diatrypa Xanthoxensis*
D., *D. Leonotidis*.

IC FUNG VOL III

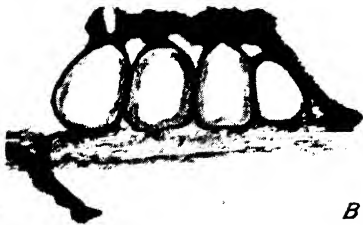
SPHAERIACEAE

TAB CVI

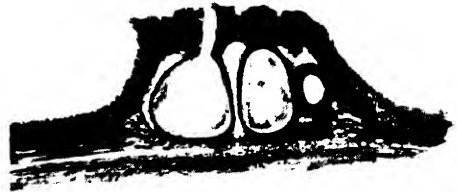


D. BONA SPTI

A



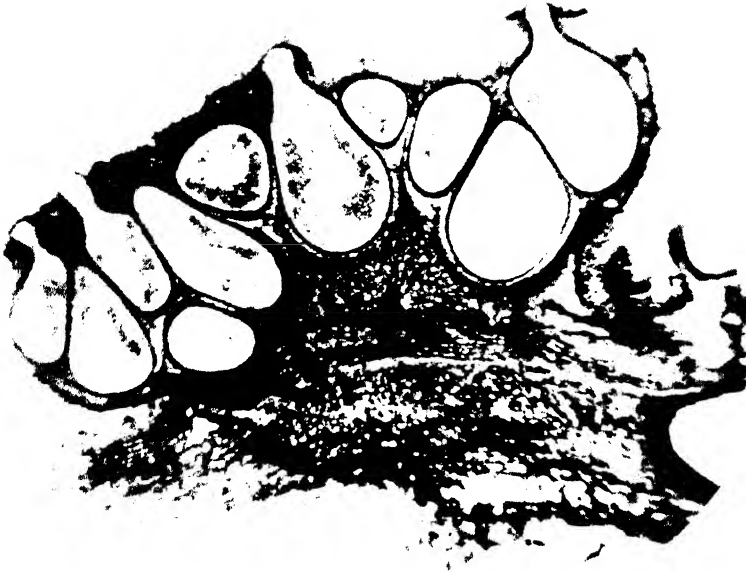
B



C

PLATE 10.

A. Berlese's Drawings. D. *Bona Spti*.B., C.—D. *MacOcaniana*.



A



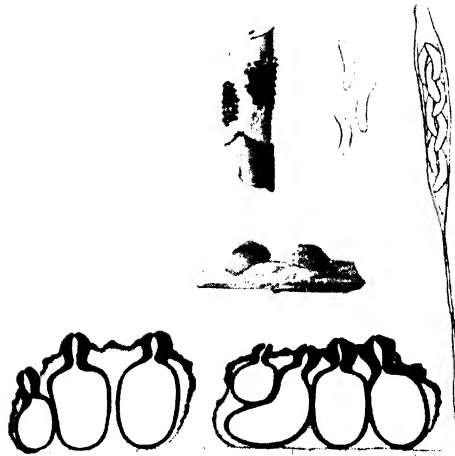
B

PLATE II.
Diatrype auristroma.

HC TUNG, VOL III

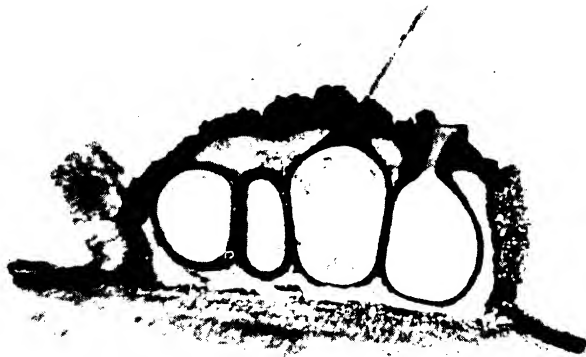
SPHAERIACEAE

TAB CXIII



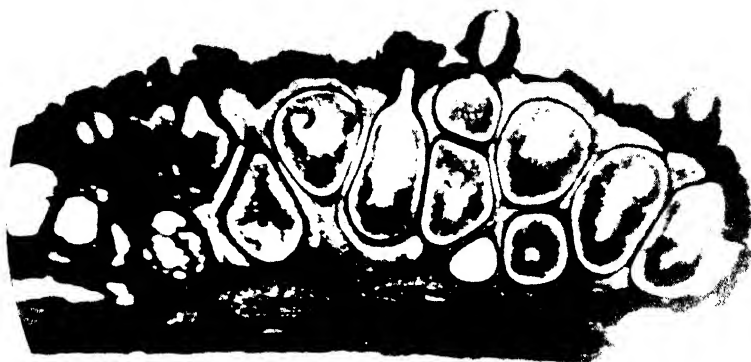
D. CAMINATA

A

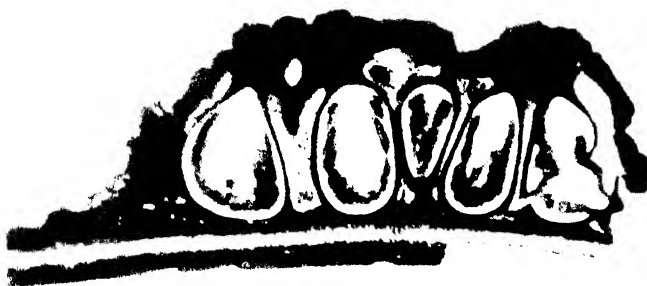


B

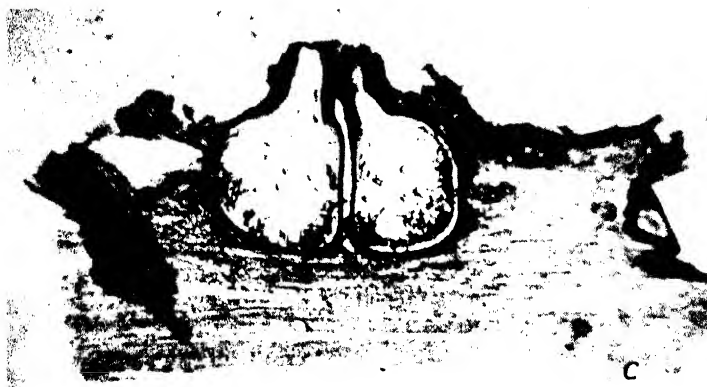
PLATE 12.
D. Caminata.



A



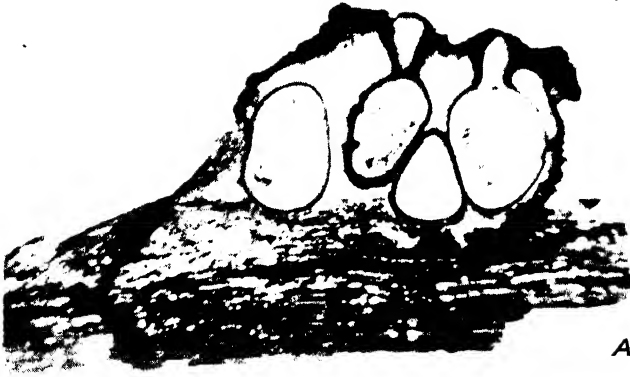
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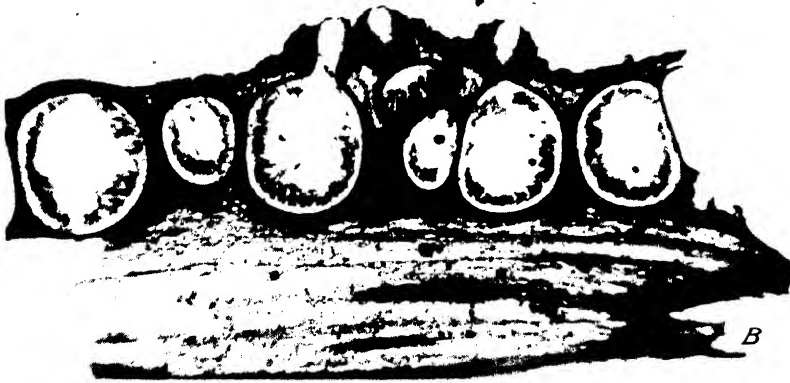
C

PLATE 13.

A., B. *Diatrype conferta*.C. *Diatrypella Morganii*.



A



B



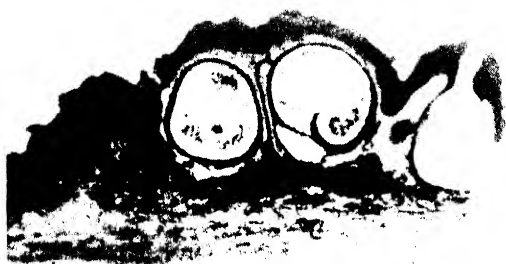
C



D

PLATE 14.

A.—*Diatrypella oligostroma*.B.—*D. Agaves*.C., D.—*D. Natalensis*.



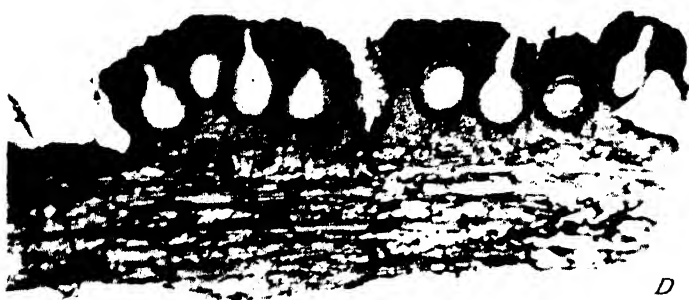
A



B



C



D



E

PLATE 15.

A., B.—*Diutrypella pretoriensis*.C.—*Pseudothrus Pterocarp*i.

AN ACCOUNT OF THE SOUTH AFRICAN MATERIAL OF *ARISTIDA* LINN. IN CERTAIN EUROPEAN AND SOUTH AFRICAN HERBARIA.

By

H. G. Schweickerdt.

Scope of the Present Paper.

Until the time of publication of Henrard's classical Revision and Monograph of the genus *Aristida* L., great difficulty was experienced in naming critically any South African material of this genus. As Henrard was in a position to examine only a limited number of South African specimens owing to the great amount of time which the examination of such a large genus necessarily involved, the author of the present paper undertook to align and name up critically all the material in the South African Herbaria. He, furthermore, extended his original intention and later on included the South African material deposited in most of the Herbaria enumerated below. In the course of these investigations several difficulties were encountered. Several doubtful points however have also been settled. Where necessary and desirable the specific descriptions as given by Henrard have been modified to include the very wide range of material (about 6,000 sheets) studied. The sequence of the enumerated species is not strictly according to the plan as adopted by Henrard; his work, however, has formed a basis which the present author has merely attempted to enlarge upon.

Acknowledgments.

My sincere thanks are due to the Directors of the various Herbaria mentioned below for the many facilities afforded in the carrying out of these investigations. Special thanks are due to Mr. C. E. Hubbard of Kew and Prof. Dr. R. Pilger of Berlin-Dahlem, for their kind assistance and suggestions.

Herbaria Consulted.

The various Herbaria in which the numerous specimens cited are deposited, have been indicated by the bracketed abbreviations following such specimens. These indices refer to the respective Herbaria enumerated below.

- A..... Albany Museum, Grahamstown.
- B..... Botanisches Museum, Berlin-Dahlem.
- BH..... Bolus Herbarium, Cape Town.
- BM..... British Museum (Natural History), London.
- D..... Natal Herbarium, Durban.
- G..... Conservatoire Botanique, Geneve.
- GU..... Grey University College, Bloemfontein.
- K..... Royal Botanic Gardens, Kew.
- L..... Rijksherbarium, Leiden.

LG.....	Herb. Trinius, Leningrad.
Mc.....	McGregor Museum, Kimberley.
N.....	National Herbarium, Pretoria.
O.....	Fielding Herbarium, Oxford.
P.....	Museum National d'Histoire Naturelle, Paris.
S.....	South African Museum, Capetown.
Sreg.....	Regional Herbarium, University, Stellenbosch.
St.....	University of Stellenbosch.
T.....	Transvaal Museum, Pretoria.
U.....	University of Cape Town.
V.....	Naturhistorisches Museum, Wien.
W.....	U.S. National Herbarium, Smiths. Inst., Washington.
WR.....	University of Witwatersrand, Johannesburg.
Z.....	Botanisches Museum, Zürich.

In addition to the above, the following abbreviations are used throughout:—

Henrard Crit. Rev... A Critical Revision of the Genus *Aristida* by J. Th. Henrard in Mededeelingen van 's Rijksherbarium Leiden Nos. 54 (1926), 54A (1927), 54B (1928), 54C (1933).

Henrard Monogr..... A Monograph of the Genus *Aristida* by J. Th. Henrard in Mededeelingen van 's Rijksherbarium Leiden Nos. 58 (1929), 58A (1932), 58B (1933).

The Subdivisions of the Genus.

Henrard's brilliant Revision and Monograph of the genus has shown that the species readily fall into seven sections. The species of any one particular section form with but a few exceptions, a fairly homogeneous group. These sections are based solely on organographic characters of the inflorescence, i.e. the spikelet. So far the existing sections of the genus have proved to be quite adequate.

Theron in Fedde, Rep. 40. I. ff. (1936) has published the results of an anatomical study of the leaves of many South African species of *Aristida*. He has drawn up four anatomical groups and cites the species constituting these groups. His first group consists of species typical of § *Stipagrostis* and § *Schistachne*. The second group consists of species belonging to §§ *Stipagrostis*, *Chaetaria* and *Arthratherum*. The third group is formed by elements belonging to §§ *Stipagrostis*, *Arthratherum*, *Chaetaria* and *Pseudarthratherum*. The fourth group consists of members belonging to the § *Stipagrostis*.

All the anatomical groups except the fourth are thus composed of elements taken from two or more organographic sections and thus if considered from an organographic point of view these groups are extremely heterogeneous in constitution. If the leaf anatomy leads one to place together in one group such diverse elements as *A. geminifolia*, *A. bipartita*, *A. barbicollis* and *A. spectabilis*, all of which are organographically very distinct from each other, a classification based on leaf anatomy is highly artificial and shows no advantages over a natural classification based solely on organographic characters. Theron's fourth anatomical group consisting of *A. lanipes*, *A. gonatostachys*, *A. subacaulis* and *A. Hermannii* is the only one acceptable since its constituents form a fairly homogeneous unit both from an anatomical and organographic point of view. It is interesting to note that the anatomical structure of the leaves in *A. capensis* and *A. sericans* bear very great resemblance to each other. These species organographically likewise show a great deal of convergence. The recently described *A. capensis* Thunb. var. *Dieterleniana* mihi superficially resembles *A. sericans* Hack. so closely that these plants could readily be confused. Theron's argument

that an anatomical key to the **species** (South African) of *Aristida* is of economic importance is justified up to a degree. It is only after one is able to distinguish the various S. African **genera** of Gramineae solely on basis of their vegetative characters that the results of Theron's researches will fully be made use of.

Key to the Sections and the South African Species.

1. Central awn, or central and both lateral awns of the lemma distinctly plumose..... 2
Central awn, or central and lateral awns never plumose.... 3
 2. Body of the lemma with an articulation situated at or just above its middle ; at maturity the awns and column break off together with the conical hollow upper part of the lemma..... I. § *Schistachne*.
Body of the lemma not articulated at or slightly above its middle, but moreover the column of the awns is articulated at its point of insertion near or at the apex of the lemma ; column together with the awns disarticulating upon maturity without a part of the lemma..... II. § *Stipagrostis*.
Body of the lemma, column and awns show no signs of an articulation..... III. § *Chaetaria*.
 3. Body of the lemma, column and awns show no signs of an articulation ; column present or totally wanting ; callus never bifid..... III. § *Chaetaria*.
An articulation is present, very rarely absent, but if so then callus always bifid..... 4
 4. The articulation is situated at the summit of the column just below the branching point of the awns ; column usually well developed ; callus never bifid..... IV. § *Pseudarthratherum*.
The articulation is situated between the summit of the lemma and the foot of the column ; if the column is absent then the callus is distinctly bifid or rounded..... 5
 5. Callus bifid, emarginate, truncate or long-acute ; column of awns usually well-developed ; if absent, then the callus distinctly bifid. The articulation is situated between the apex of the lemma and the foot of the column..... V. § *Arthratherum*.
Callus rounded ; column is totally wanting, the articulation is situated between the lemma and the branching-point of the awns ; margins of the lemma involute..... VI. § *Pseudochaetaria*.
- I. § *Schistachne* (Fig. et Denot.) Henr.**
1. Panicle very dense and spikelike ; spikelets nearly sessile ; position of the glumes usually inverse, the lower usually distinctly longer than the upper..... 2
Panicle not dense and spikelike, but loose, or more or less contracted ; spikelets pedicelled ; position of the glumes not inverse, the lower shorter or much shorter than the upper..... 3
 2. Lower glume long hairy..... *Hochstetteriana* (1).
Lower glume never hairy..... *secalina* (2).

3. All the awns of the lemma plumose, usually equally strongly so, or the lateral awns not as densely plumose as the central awn..... 4
 Only the central awn of the lemma plumose and densely feathery upwards, the lateral awns never plumose..... 7
4. Internodes woolly or pubescent just below the nodes; panicle-branches woolly-pubescent..... *proxima* (3).
 Internodes glabrous or scaberulous but never woolly-pubescent; panicle-branches scabrous or glabrous..... 5
5. Suffrutescent and rigid perennial; innovations and branches fascicled; culms 4-5-noded; nodes perfectly glabrous.. *namaquensis* (4).
 Caespitose perennial; culms never branched; nodes conspicuously bearded with a ring of spreading white hairs.. 6
6. Glumes acutish, 14-16 mm. long, plumose awns obtuse in outline..... *Schlechteri* (5).
 Glumes obtuse, about 10 mm. long, plumose awns acute in outline with naked exerted tips..... *hybrida naturalis* (6).
7. Glumes of a very firm texture, cartilaginous, glabrous or rigidly ciliate, subequal, linear-oblong, obtuse, with emarginate and slightly ciliolate tips..... 8
 Glumes thin, hyaline or papery in texture, glabrous or softly hairy, unequal, lanceolate, acuminate..... 13
8. Nodes conspicuously bearded with a ring of spreading white hairs..... 9
 Nodes perfectly glabrous and smooth..... 12
9. Leaf-sheaths and leaf-blades of culm and innovations densely lanate or villous..... *ciliata* Desf. var. *villosa* (7a).
 Leaf-sheaths and leaf-blades of culm and innovations never woolly or villous, sometimes slightly hairy on the margin 10
10. Glumes glabrous, not ciliate with spreading hyaline hairs.. *ciliata* Desf. var. *capensis* (7).
 Glumes or at least the upper glume ciliate with spreading hyaline hairs..... 11
11. Both glumes ciliate with spreading hyaline hairs..... *ciliata* Desf. var. *pectinata* (7b).
 Only the upper glume with spreading hyaline hairs..... *ciliata* Desf. var. *tricholaena* (7c).
12. Glumes 8.5-12.5 mm. long, usually glabrous, rarely both rigidly ciliate..... *Schaeferi* (8).
 Glumes 8-9 mm. long, only the upper ciliate with rigid long hyaline hairs..... *Schaeferi* Mez var. *biseriata* (8a).
13. Panicle erect, linear, very narrow and contracted, but somewhat interrupted near the base; glumes 12-16 mm. long *Dinteri* (9).
 Panicle open, rather loose; glumes 6-8 mm. long..... 14

14. Glumes covered with soft spreading hairs..... *prodigiosa* (10).
 Glumes quite glabrous..... *prodigiosa* Welw. var.
calva (10a).

II. § *Stipagrostis* (Nees) Trin. et Rupr.

1. All the awns plumose with long spreading hairs, or the lateral awns at times very scantily plumose (almost naked).. 2
 Only the central awn plumose with long spreading hairs, the lateral awns quite naked or very rarely scantily adpressedly ciliate-pubescent..... 11
2. Column of awns well developed (1·5–12 mm. long) and more or less twisted..... 3
 Column of awns wanting, or sometimes only very short or minute, not twisted into a beak..... 8
3. Nodes glabrous; tip of the central awn always very acute in outline..... 4
 Nodes distinctly bearded with a ring of hyaline spreading white hairs; central awn plumose to the very tip, obtuse in outline..... *Schlechteri* (5).
4. Column of awns quite glabrous..... 5
 Column of awns distinctly hairy..... 6
5. Column of awns much exceeding the glumes; feathers of awns usually bright yellow..... *capensis* Thunb. var.
macropus (11b).
 Column of awns shorter than or slightly exceeding (by 1–2 mm.) the glumes, feathers of awns white or canescent... *capensis* Thunb. var.
genuina (11a).
6. Glumes glabrous..... 7
 Glumes distinctly softly hairy..... *capensis* Thunb. var.
Dieterleniana (11c).
7. Panicle usually overtopped by the leaves; glumes subequal; column of awns up to 4 mm. long..... *capensis* Thunb. var.
barbata (11d).
 Panicle not overtopped by the leaves; glumes slightly unequal; column of awns 6–12 mm. long..... *capensis* Thunb. var.
canescens (11e).
8. Lower glume exceeding the upper in length; axils of the panicle-branches glabrous..... *damarensis* (12).
 Lower glume shorter than the upper; axils of the panicle-branches glabrous or bearded..... 9
9. Panicle dense and spike-like; axils of the panicle-branches glabrous; the branching-point of the awn produced into two thin, hairy appendages; awns about equal, up to 10 mm. long, equally strongly plumose..... *sabulicola* (13).
 Panicle effuse, pyramidal; the branching-point of the awns not produced into appendages; awns unequal, the central awn densely plumose, the lateral awns almost naked (at most very scantily plumose)..... 10

10. Axils of the panicle-branches distinctly bearded ; central awn obtuse in outline..... *Marlothii* (14).
 Axils of the panicle-branches quite glabrous ; central awn subacute in outline..... *lutescens* (15).
11. Dwarf annuals, not exceeding 10 cm. in height ; inflorescences much congested and almost spike-like..... 12
 Perennial species, or if annual then taller than 10 cm..... 13
12. Plants compactly caespitose with the inflorescences almost hidden among the leaf-blades ; branching-point of the awns not conspicuously hairy..... *subacaulis* (16).
 Plants more diffuse with the culms geniculately ascending ; lower nodes usually well-exserted ; branching-point of the awns conspicuously hairy..... *Hermanni* (17).
13. Glumes hirsute or pilose over their whole surface, sometimes glabrous only at the tips..... 14
 Glumes glabrous and smooth over their whole surface, rarely with a few marginal hairs, or scaberulous on their whole surface..... 18
14. Column of the awns glabrous below their branching-point or without a pencil of hairs at their branching-point ; central awn obtuse in outline, plumose to the very tip ; panicles short, spike-like, congested, often sheathed by the uppermost leaf..... 15
 Column of the awns hairy below their branching-point, or with a pencil of hairs at their branching-point ; central awn with a naked exserted tip ; glumes shortly hairy or pubescent..... 16
15. Culms with very unequal internodes, short near the base, longer upwards and short again towards the top ; leaf-blades of culm-sheaths not well-developed..... *geminifolia* (18).
 Culms with very nearly equal internodes ; leaf-blades of culm-sheaths well-developed..... *fastigiata* (19).
16. Annual plants ; lower glume up to 6 mm. long, the upper up to 10 mm. long..... *hirtigluma* (20).
 Erect perennial plants ; lower glume \pm 10 mm. long, the upper \pm 13 mm. long..... 17
17. Central awn equally plumose from the base to very near the tip..... *gracilior* (21)
 Central awn naked below, with a pencil of hairs at the branching-point of the awns..... *gracilior* Pilger var. *intermedia* (21a).
 Central awn naked in the lower part, not bearded at the branching-point of the awns..... *gracilior* Pilger var. *Pearsonii* (21b).
18. Lower glume exceeding the upper in length ; lower glume with many longitudinal rows of minute scabrous hairs on the outer surface..... *obtusata* (22).
 Lower glume shorter than the upper ; lower glume not conspicuously minutely scaberulous..... 19

19. Vegetative parts covered with tubercular prominent glands ;
suffrutescent rigid perennial..... *brevifolia* (23).
Vegetative parts devoid of tubercular glands ; suffrutescent
or caespitose perennials, rarely annuals..... 20
20. Column with a pencil of hairs at the branching-point of the
awns..... 21
Column without a pencil of hairs at the branching-point of
the awns..... 23
21. Central awn naked at least in its lower third..... *uniplumis* (24).
Central awn plumose to the base..... 22
22. Glumes about 14 mm. long ; central awn somewhat rigid and
bristle-like..... *uniplumis* Licht. var.
Neesii (24a).
Glumes 8-10 mm. long ; central awn not as above..... *uniplumis* Licht. var.
Pearsonii (24b).
23. Sheaths of the innovations densely white woolly or at least
the margins villous ; dwarf caespitose plants..... 24
Sheaths of the innovations never densely white-woolly ;
plants usually from a suffrutescent much-branched base..... 25
24. Leaves long-hairy between the longitudinal ridges. Axis of
inflorescence scaberulous. Nodes and apices of pedicels
hairy..... *gonatostachys* (25).
Leaves glabrous. Axis of inflorescence glabrous. Nodes
and apices of pedicels not long-hairy..... *lanipes* (26).
25. Axils of panicle-branches with conspicuous pencils of hairs *Marlothii* (14).
Axils of panicle-branches glabrous..... 26
26. Central awn plumose, acute in outline ; glumes glabrous,
unequal..... 27
Central awn plumose, obtuse in outline ; glumes subequal,
usually purple, the lower in the young state dorsally often
somewhat shortly hairy, scaberulous on the keel upwards *Dregeana* (27).
27. Column 8-10 mm. long..... *garubensis* (28).
Column 2-5 mm. long..... *lutescens* (15).

III. § *Chaetaria* (Beauv.) Trin.

1. Awns and column of the lemma densely plumose and hairy
as in § *Stipagrostis*..... 2
Awns and column of the lemma never plumose or hairy, at
most scabrid or glabrous only..... 3
2. Glumes densely villous ; nodes perfectly glabrous..... *sericans* (29).
Glumes quite glabrous ; nodes with a ring of long spreading
white hairs..... *hybrida naturalis* (6).
3. Internodes covered with a fugacious adpressed wool below
the nodes, or lanate-woolly all over, sometimes the lower
internodes only woolly or pubescent-lanate and the upper
glabrous..... *Sciurus* (30).
Internodes glabrous or scabrous, rarely with some short hairs
below the nodes..... 4

4. Panicles dense and spike-like or laxly contracted and more or less interrupted..... 8
 Panicles effuse and open, with the branches remote and divaricate..... 5
5. Position of the glumes inverse, the lower glume exceeding the upper in length..... *bipartita* (31).
 Position of the glumes not inverse, but subequal or the lower much shorter than the upper..... 6
6. Annual plants, often somewhat delicate..... 7
 Perennial plants, usually somewhat robust; the lemma shorter than or as long as the glumes; the tips of the glumes reaching up to or surpassing the branching-point of the awns..... *canescens* (34).
7. Glumes very acute, prominently awned, exceeding the lemmas..... *scabrivalvis* (32).
 Glumes acute or obtuse, not awned, or the upper glume at most bifid with a mucro from the sinus; lemmas as long as or longer than the glumes..... *effusa* (33).
8. Column well-developed, very variable in length, distinctly twisted..... 9
 Column wanting or lemma is produced into a short scarcely-twisted beak..... 12
9. Lower glume exceeding the upper in length, position of glumes "inverse"..... *monticola* (35).
 Lower glume always shorter than the upper..... 10
10. Glumes unequal, the lower about $\frac{1}{2}$ to $\frac{2}{3}$ as long as the upper; internodes distinctly compressed..... *junciformis* (36).
 Glumes about equal or slightly unequal, the upper only 1-1.5 mm. longer than the lower; internodes not compressed..... 11
11. Spikelets small; glumes shorter than 10 mm.; lateral awns almost absent or at least much more weakly developed than the central awn; culms usually much-branched from the nodes..... *transvaalensis* (37).
 Spikelets larger; glumes about 10 mm. long or longer, the lower frequently slightly recurved from the apex and either smooth, scaberulous to minutely hairy especially towards the tip; culms rarely branched from the nodes..... *aequiglumis* (38).
12. Lower glume exceeding the upper in length..... 13
 Lower glume always shorter than the upper..... 14
13. Lemmas with longitudinal rows of spiny hairs..... *rhiniochloa* (39).
 Lemmas smooth, the midrib scabrous only..... *andoniensis* (40).
14. Panicles very dense and spike-like, obovate in outline, up to 6 cm. long; body of lemma very scabrous with longitudinal rows of spiny hairs and furrowed ventrally..... *Hubbardiana* (41).
 Panicles not densely spike-like; body of lemma not very scabrous and not furrowed ventrally..... 15

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|--|--|
| 15. Perennial plants..... | 16 |
| Annual plants..... | 19 |
| 16. Glumes very unequal, the lower about half the length of the upper ; spikelets usually small and dark purple..... | <i>recta</i> (42). |
| Glumes equal or unequal, the lower more than two-thirds as long as the upper..... | 17 |
| 17. Culms markedly compressed below the nodes especially towards the base..... | <i>junciformis</i> (36). |
| Culms terete..... | 18 |
| 18. Culms 1-noded ; blades very narrow, setaceous ; panicles short, about 2-2.5 cm. long, lax..... | <i>Galpinii</i> (43). |
| Culms more-noded ; blades flat ; panicles not short, usually long or very long..... | <i>canescens</i> (34). |
| 19. Glumes very obtuse and rather broad, both erosebifid and with a mucro from the sinus..... | <i>curvata</i> (44). |
| Glumes acute or subacute and minutely awned, at least the lower, the upper commonly obtuse and bifid, with a mucro from the sinus..... | 20 |
| 20. Awns of the lemma triquetrous above, very flat over a long distance, with a pronounced midnerve and hyaline rather broadly winged margins ; panicle erect and rather compact and spike-like, now and again somewhat interrupted... | <i>submucronata</i> (45). |
| Awns of the lemma terete or mostly subtriquetrous, sometimes slightly winged only at the very base, without broad hyaline margins ; panicle somewhat lax at times even flexuous, not very dense and spikelike..... | <i>adscensionis</i> L. subsp.
<i>guineënsis</i> (46). |

IV. § *Pseudarthratherum* Chiov.

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|---|----------------------------|
| 1. Panicles lax and open or composed of more or less peduncled false spikes, sometimes loosely contracted, the long branches erect and appressed, but always naked below and never dense and spike-like..... | <i>barbicollis</i> (47). |
| Panicles densely contracted, spike-like, the branches very short, spikelet-bearing from the base, sometimes interrupted or with 1-2 peduncled additional false spikes at the base, rarely not dense and spike-like, but narrowly linear and more or less interrupted, with flexuous sub-second branches nearly always spikelet-bearing from the base..... | 2 |
| 2. Lemma granular, densely tubercled in its upper part, quite smooth only in its lower quarter-part..... | <i>alopecuroides</i> (48). |
| Lemma smooth, or scabrous only under a strong lens, never densely tubercled..... | 3 |
| 3. Panicles contracted and much-branched, the branches erect or slightly spreading, never spike-like, glumes not very unequal, panicle up to 20 cm. long..... | <i>Pilgeri</i> (49). |
| Panicles spike-like, densely contracted, if branched or interrupted at the base, then branches usually spreading, glumes unequal..... | 4 |

4. Rigid perennials, inflorescence up to 20 cm. long..... *longicauda* (50).
 Annual or perennial, inflorescence rarely up to 15 cm. long,
 the whole plant usually not exceeding 60 cm. in height.. *congesta* (51).

V. § *Arthratherum* (Beauv.) Reichb.

1. Callus bifid or more rarely almost truncate, rounded or slightly emarginate..... 2
 Callus conical, long acute, never bifid..... 10
2. Glumes equal or nearly so..... *spectabilis* (52)
 Glumes very unequal..... 3
3. Foot of awns more than 2 cm. long, usually 2.5–3 cm. long *stipoides* (53).
 Foot of awns shorter than 2 cm., usually only about 1 cm. long..... 4
4. Ligule a more or less woolly fringe, or a denseline of long soft hairs surrounding the mouth of the sheaths like a flake of wool; if flake of wool absent then the lowermost internodes densely lanate..... 5
 Ligule a line of very short hairs, no flake of wool present.. 6
5. Lower internodes densely woolly, the upper glabrous; column of awns rather short, about 6.5 mm. long..... *vestita* (54).
 Lower and other internodes glabrous; column of awns usually rather long, up to 15 mm. long..... *meridionalis* (55).
6. Culms usually fascicled from a much-branched base and lower nodes..... 7
 Culms never fascicled but usually one- to several-noded.. 8
7. Callus truncate, obliquely truncate, rounded or even slightly emarginate; lemma dorsally glabrous, very rarely minutely scaberulous..... *dasydesmis* (56).
 Callus distinctly bifid; lemma dorsally distinctly scaberulous *Engleri* (57).
8. Culms several-noded; lower glume \pm 6 mm. long, the upper \pm 12 mm. long..... *diffusa* Trin. var. *Burkei* (58a).
 Culms 1–2 noded; lower glume \pm 8–9 mm. long, the upper \pm 15–18 mm. long, if both shorter then the column very short or almost absent..... 9
9. Column very short or absent..... *diffusa* Trin. var. *pseudohystrix* (58b).
 Column well developed \pm 7 mm. long..... *diffusa* Trin. var. *genuina* (58).
mollissima (59).
10. Internodes densely woolly or lanate-tomentose..... 11
 Internodes quite glabrous or minutely scaberulous only, never pubescent.....

11. Inflorescence dense, more or less elongate and spike-like ;
 column of awns more than 3.5 cm. long..... *stipitata* (60).
 Inflorescence fairly lax, never dense and spike-like ; column
 of awns about 2 cm. long or somewhat longer..... *graciliflora* (61).

VI. § *Pseudochaetaria* Henr.

Only South African species..... *hordeacea* (62).

ENUMERATION OF THE SPECIES.

1. **A. *Hochstetteriana* Beck ex Hack.** in Verh. Bot. Ver. Prov. Brandenb. **30.** 144 (1888) ; Dur. et Schinz, Consp. **5.** 803 (1894) ; Hack. in Bull. Herb. Boiss. **4.** Append. iii. 18 (1896) ; Stapf in Dyer, Fl. Cap. **7.** 571 (1899) ; Bolus in Ann. S. Afr. Mus. **9.** iv. 234 (1915) pro parte ; Dinter in Fedde, Rep. **15.** 342 (1918) ; Garabedian in Ann. S. Afr. Mus. **16.** ii. 402 (1925) pro parte ; Henrard Crit. Rev. **2.** 234 (1927) ; Henrard Monogr. **1.** 37 cum ic. tab. 1 (1929) ; Range in Fedde, Rep. **33.** 9 (1933).

Perennial, densely caespitose, branched from near the base, forming dense tufts. *Culms* simple, up to about 50 cm. high, erect or somewhat geniculately ascending, 2-4-noded ; internodes terete, substriate, minutely scaberulous or glabrous ; nodes glabrous, often swollen, exserted. *Lower leaf-sheaths* reduced and scale-like, with very short blades, striate, scaberulous, often more or less woolly at the base ; upper leaf-sheaths tight, striate, scaberulous or with scattered long tubercle-based hairs, shorter than the internodes ; *ligule* a short ciliate rim ; auricles shortly ciliate more rarely long-bearded ; collar smooth ; *blades* convolute or setaceous, those of the innovations up to 14 cm. long, the culm-blades up to 25 cm. long, ending in a setaceous point, glabrous or with scattered long tubercle-based hairs beneath, hirtellous on the upper surface, striate. *Panicle* excluding the awns up to 9 cm. long, usually much shorter, dense, spike-like, up to 1 cm. broad ; axis scaberulous, the lowermost axils of the branches sometimes with a tuft of hairs ; branches solitary, divided nearly from the base ; branchlets very short, scabrous ; pedicels scabrous, about 1-2 mm. long, clavate. *Spikelets* congested, yellowish or greenish. *Glumes* narrowly linear or lanceolate, acuminate, 3-nerved with a stronger midnerve ; the lower glume very scabrous and with long spreading hairs especially dorsally, 13-18 mm. long, *not always exceeding the upper glume in length* ; the upper glume about 12-17 mm. long, glabrous or scaberulous only. *Lemma* spindle-shaped, together with the callus and up to the articulation 5-7 mm. long, below the articulation densely punctulate-scabrous, above the articulation smooth, from the articulation to the branching-point of the awns 8-10 mm. long ; column slightly scaberulous, twisted ; central awn plumose and long-feathery above the middle, the feathery part obtuse in outline, naked in lower quarter, with a naked excurrent tip, 5.5-7.5 cm. long ; lateral awns fine, scaberulous or smooth, 2.2-2.4 cm. long. *Callus* very acute, adpressedly hairy below, long-hairy above, 2.0-2.5 mm. long. *Anthers* 6.0-7.0 mm. long.

SOUTH-WEST AFRICA.

Onguati, lichte Buschsteppe, IV. 1913, *Engler* 6187 (B, K) ; Spitzkopje, V. 1936, *Boss* TM 36138 pro parte (T) ; Spitzkopje, I. 1937, *Boss* TM 36359 and 36378 (T) ; Usakos, V. 1936, *Wilson* NH 21388 (N) ; do., XII. 1938, *Volk* 133 (D) ; Aukas, V. 1930, *Bradfield* 571 (N) ; Kubas-Habis, IV. 1913, *Dinter* 2820 (B) ; Kubas-Ababis, IV. 1913, *Engler* 6134 (B) ; Haikamchab, I. 1907, *Galpin et Pearson* 7594 (K, N, V) ; Otjimbingue, 1897, *Fischer* 68 (B) ; Walfish Bay, 100 KM east of, *Wyley* s.n. (V) ; Quartel near Rehoboth, IV. 1911, *Dinter* 2172 (B) ; along the Gamgam River, III. 1905, *Von Trotha* 15a (B) ; Gamkamas, III. 1911, *Dinter* 1990 (B, W) ; Gelwater near Gibeon, IV. 1912, *Range* 1328 (B, W) ; Kammachas, *Range* 1415 (B) ; Mount Brukkaros, IV. 1927, *Sordahl* 37 (BM, W)

et *Sordahl* 38 pro parte (BM); Am Löwenfluss bei Gawachab, II. 1910, *Schäfer* 444 (B); 12 KM west of Sandverhaar, II. 1909, *Pearson* 4605 (K); Inachab, Sandrivier, *Dinter* 1107 (B, Z); Haobes (Hoabes?), *Dinter* 1473 (B); without precise locality, *Pearson* 7798 (BH, K) and *Lüderitz* 66 (B, Z).

TYPE SPECIMEN.

The type-gathering (*Wyley* s.n.) consists of 7 sheets deposited in the Naturhistorisches Museum, Wien. Beck's manuscript description and dissections are still attached to one of the sheets, and this has consequently been selected by Henrard (Crit. Rev. 235) as the type.

ECONOMIC NOTES.

This species is considered an especially valuable grass. Several collectors state in their field notes that it is much relished by stock.

2. *A. secalina* Henrard Crit. Rev. 3. 552 (1928); Henrard Monogr. 1. 36 cum ic. tab. 1 (1929).

A. Hochstetteriana Beck ex Hack. sec. Garabedian in Ann. S. Afr. Mus. 16. ii. 402 (1925) pro parte, non Beck ex Hack. *Aristida* nov. spec. ex aff. *A. hordeaceae* sec. Hack. in Bull. Herb. Boiss. 4 Append. iii. 20 (1896).

Since this species is very closely related to *A. Hochstetteriana* and may only be distinguished from this in having a glabrous lower glume, it was thought superfluous to draw up a separate description. The description of *A. Hochstetteriana* thus covers the following specimens except for the point of difference mentioned above.

SOUTH WEST AFRICA.

Northern districts (no definite locality indicated), I. 1930, *Drinkuth* 4 (B, K, N, W); Outjo, V. 1933, *Ter Horst* TM. 31844 (T); Spitzkopje, I. 1937, *Boss* TM. 36401 (K, N, T); Karibib, IV. 1913, *Engler* 6163 (B, K); Haikamchab, I. 1907, *Galpin et Pearson* 7435 (K, N, S); Awas mountains, V. 1936, *Boss* TM. 36237 (T); Reise von Walfishbay nach Okahandja, XI. 1885, *Lüderitz* 72 (B, Z); Hereroland, anno 1885/1886, *Lüderitz* 43 (B).

TYPE SPECIMENS.

The two sheets *Lüderitz* 72 et 43 are deposited in the Botanisches Museum, Berlin-Dahlem.

REMARKS.

Henrard (Crit. Rev. 552) states that the specimens on which he based his description are in a very imperfect condition. Owing to the very overmature and damaged condition of *Lüderitz* 72, the present author has found it somewhat difficult to align and identify modern material with this species. After much deliberation and careful examination of the type specimen, he has decided that *A. secalina* Henrard is a close ally of *A. Hochstetteriana* Beck ex Hack. It differs from the latter species by having glabrous glumes. The inverse length of the glumes is not a constant difference, since this character is also met with in *A. Hochstetteriana*.

Henrard's type shows the presence of spikelets in which the column of the lemma is not twisted. This may be explained by the fact that these lemmas are not well-developed. Otherwise they would have disarticulated, since most of the other columns were shed. The more recent gathering *Galpin & Pearson* 7435 also shows the presence of spikelets in which the column of the lemmas is either twisted or not twisted, a character which is thus not reliable. The type specimen has naked central awns. Careful examination has revealed the presence of many "tubercles" in the upper part of these awns. These "tubercles" undoubtedly represent the points of attachment of hairs, and thus the awns at one time or other were plumose. The opinion voiced by Henrard that this species is an "anomalous" [Monogr. Gen. *Aristida* 1. 24 (1929)] member of the § *Schistachne* can thus no longer receive any support.

3. *A. proxima* Steud. Syn. Pl. Glum. 1. 145 (1854); Dur. et Schinz, Consp. 5. 807 (1894); Stapf in Dyer, Fl. Cap. 7. 566 (1899); Henrard Crit. Rev. 3. 468 (1928); Henrard Monogr. 1. 38 cum ic. tab. 4 (1929); Theron in Fedde, Rep. 40. 14 (1936).

Elegant, erect or ascending glaucous *perennial*. Culms simple or more rarely branched near the base which appears to be a creeping rhizome, 15–35 cm. high, densely woolly at and just below the nodes, otherwise pubescent, terete or subcompressed, 2–6-noded; internodes usually shortly exserted. Sheaths striate, tight, pubescent with adpressed hairs, the sheath-nodes with a ring or tuft of long white hairs, densely tomentose or woolly; ligules a ciliate rim; auricles densely bearded, the hairs united into a ring at the junction of the blade and the sheath; blades convolute, filiform, rigid and subpungent, glaucous, adpressedly pubescent in lines or becoming glabrous beneath, more or less scabrous-hirtellous on the upper surface, curved, gradually narrowed but not setaceously pointed, up to 10 cm. long, but usually much shorter. Panicle narrow, but rather loose, up to 15 cm. long, but usually shorter, well- or shortly-exserted or sheathed by the uppermost leaf at the base; peduncle pubescent or hairy, angular or subterete; axis of panicle subterete and grooved, somewhat contorted, adpressedly hairy, the axils densely woolly; branches binate, erect, simple or the lower branched above the middle, naked in lower part, up to 5 cm. long, few-flowered, usually only 2–5-spiculate, pubescent; pedicels erect or more or less curved, up to 8 mm. long or sometimes as long as the glumes, subclavate, densely woolly towards their tips. Spikelets yellowish and pallid. Glumes unequal, glabrous and smooth, 3-nerved, the lateral nerves shorter than the midnerve and anastomosing with it; the lower 6.5–10 mm. long, the upper 8–11.5 mm. long, both acuminate and mucronate from a slightly bifid apex, both scaberulous only on the keel above. Lemma glabrous, lanceolate-oblong, rounded at the base, abruptly narrowed into the 1.5–2 mm. long callus, body of lemma including the callus 5.25–7.0 mm. long; callus very acute and narrow, long-pointed, densely hairy; articulation of the lemma about 3.5–5 mm. from the base of callus. Awns deciduous with upper part of the lemma, subequal or usually the central awn longer, plumose all along, the lateral from 5.5–9.0 mm. long, the central awn 6.0–11.5 mm., tips not exserted, feathery part very obtuse in outline. Pale broader than long, truncate, nerveless. Lodicules very obtuse. Anthers 4 mm. long.

CAPE PROVINCE.

Lady Grey distr.—Between Kraai River and Wittebergen, Zeyher 194 (B, K, P, V, Z). Aliwal North distr.—Aliwal North, XII. 1892, Flanagan 1657 (A, BH, N, K); Sister Stephanie 212 (A, BH, D, K, N).

TYPE SPECIMEN.

Zeyher 194 is deposited in Herb. Steudel, Museum National d' Histoire Naturelle, Paris.

4. *A. namaquensis* (Nees) Trin. et Rupr. Spec. Gram. Stip. 174 (1842); Walp. Ann. Bot. 3. 750 (1852); Steud. Syn. Pl. Glum. 1. 145 (1854); Dur. et Schinz, Consp. 5. 805 (1894); Hack. in Bull. Herb. Boiss. 4 Append. iii. 19 (1896); Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915); Dinter in Fedde, Rep. 15. 342 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 403 (1925) pro parte; Henrard Crit. Rev. 2. 369 (1927); Henrard Monogr. 1. 39 cum ic. tab. 3 (1929); Range in Fedde, Rep. 33. 8 (1933) pro parte.

A. dregeana Trin. et Rupr. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte, non Trin. et Rupr. *A. fruticans* Burchell, Travels 1. 492 (1822) nomen tantum. *A. lutescens* Trin. et Rupr. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915), non Trin. et Rupr. *A. namaquensis* (Nees) Trin. et Rupr. var. *vagans* (Nees) Walp. Ann. Bot. 3. 750 (1852). *A. pungens* Desf. sec. Hack. in Bull. Herb. Boiss. 4 Append. III. 19 (1896); sec. Garabedian in Ann. S. Afr. Mus. 16. II. 404 (1925), omnes non Desf. *Arthratherum namaquense* Nees, Fl. Afr. Austr. 1. 185 (1841); Presl. Bot. Bemerk. 121 (1844); Linnaea 20. 253 (1847).

Suffrutescent with a long creeping rhizome, stoloniferous, innovation-buds covered with densely imbricate scale-like sheaths, the latter striate and glabrous except for the

woolly lower margins, and bearing reduced deciduous spinelike blades. *Culms* fascicled, ascending or prostrate, woody below, simple or usually with fascicles of erect branches from the lower or the middle nodes, at times very long and reaching a height of 2 meters (*Bryant*), glabrous and smooth. *Sheaths* very tight, firm, pallid, glabrous, striate or smooth, more rarely more or less hairy, longer or slightly shorter than the internodes; *ligules* and *auricles* minutely ciliate only; collar smooth; *blades* setaceous or subulate, convolute, the lower very short, very rigid and pungent, the upper longer, up to 25 cm. long, glaucous, glabrous, smooth on the lower surface, hispidulous on the upper surface. *Panicle* more or less exserted, narrow, linear, more or less contracted but rather loose, up to 30 cm. long or usually shorter; rhachis straight or subflexuous, nearly smooth, branches solitary, nearly sessile, erect or suberect, bipartite nearly from the base, or the branchlets fascicled, the lower ones up to 7.5 cm. long, scabrous and filiform like the branchlets, lateral spikelets with branches much shorter than the glumes. *Spikelets* yellowish, pallid, erect. *Glumes* rather firm, unequal, lanceolate to linear-lanceolate, acuminate, tips minutely truncate or slightly bifid, 3-nerved, glabrous, involute, the lower 8–13 mm. long, the upper 9.5–15 mm. long. *Lemma* subcylindric, glabrous, produced into a straight or somewhat twisted short beak, the body articulated 2.5–5 mm. below the branching-point of the awns, total length of lemma and column 8–11 mm; *callus* conical 1.5–2 mm. long, acute and pointed, hairy. *Awns* somewhat unequal and variable in length; the central from 11–25 mm. long, the lateral from 8–18 mm. long, all the awns plumose to the very tips, the central subobtuse and the lateral subacute in outline, the side bristles finer than the central awn and scantily adpressedly plumose at the base, more densely so above. *Pale* broad, about 1.5 mm. long, nerveless. *Lodicules* 1 mm. long, few-nerved. *Anthers* 4.5 mm. long.

SOUTH-WEST AFRICA.

Omuvaruma river, XII. 1938, *Volk* 403 (D); below Ababes, Tsondab River, XII. 1915, *Pearson* 9155 (K, S); Haikamchab, I. 1907, *Galpin et Pearson* 7426 (BH, K, N, P, S); Awas mountains, I. 1916, *Pearson* 9646 (S); between Choaberib and Gurumanes, I. 1916, *Pearson* 9416 (K); Rehoboth, XII. 1890, *Fleck* 21a (Z); between Zendlingsgrab and Kuh, III. 1905, *Von Trotha* 22 (B); Orab, *Dinter* 2027 (B, W); Gründoorn, VI. 1931, *Oertendahl* 334b (K, N); Khamis, Riverbed of Konkip, *Schultze* 471 (B); Beersheba, I. 1931, *Sordahl* 44 (BM, W); Kunguibgebirge, *Range* 1062 (B); Lüderitzbucht, *Schäfer* 377 (B); Rotkuppe Station, II. 1909, *Pearson* 4189 (A, D, K, S); 18 KM west of Aus, II. 1909, *Pearson* 4203 (BH, K); Aus, *Schenck* 171 (Z); West of Aus, II. 1909, *Pearson* 4206 (K) et 4208 (K) et 4217 (A, K); Buchholzbrunn, riverbed, II. 1909, *Pearson* 3644 (K) et 3645 (BH, K); Sandverhaar, II. 1909, *Pearson* 3710 (K, Z) et 3713 (BH, D, K, N) et 4343 (BH, K, N); Sandverhaar, I. 1910, *Schäfer* 284 (B); Inachab, XII. 1897, *Dinter* 1108 (Z); Great Karasberg, XII. 1912, *Pearson* 8078 (B, K) et I. 1913, *Pearson* 8497 (BH, BM, K, S, Z); Holoog, I. 1916, *Pearson* 9714 (B, K, S) et 9745 (BH, K, S); Kanus, I. 1910, *Range* 899 (B); Khanibes, Horos, X. 1907, *Hartmann* 14 (B); Gabis, I. 1909, *Pearson* 4324 (K); 20 KM north of Raman's Drift, I. 1909, *Pearson* 4532 (K, S); Warmbad, 1888, *Wandres* 28 (Z); without precise locality: *Wyley* s.n. (V); *Dinter* 6413 (G); *Range* 748 (B) et 96 (B).

CAPE PROVINCE.

Little Namaqualand distr.: Between Arris Drift and Arnisfontein, X. 1926, *Pillans* 5322 (K); Lekkersing, IX. 1935, *Taylor* 1083 (N); Eenriet, I. 1909, *Pearson* 3082 (K); south of Brakfontein, X. 1926, *Pillans* 5565 (BH); Aggenys, I. 1909, *Pearson* 2947 (K, N); between Arkoep and Mesklip, XII. 1910, *Pillans* 5898 (BM, K, N, S); Kamabies, XII. 1908, *Pearson* 3953 (BH, K); Kamiesberg, *Zeyher* 74 (B, G, V, W, Z); Alewynsfontein, XII. 1908, *Pearson* 3335 (K); between Plaatklip and Bitterfontein, I. 1908, *Pearson* 3298 (A, D, K, S). Calvinia distr.: At Kamos, Komseep, Springbokkuil and Lospers Plaats, *Zeyher* 1814 (A, BH, BM, G, K, N, P, S, V, Z); Brakrivier, XII. 1908, *Pearson* 3901 (K); boornriver, XII. 1908, *Pearson* 3883 (BM, N, T); near Schurkraal, XII. 1908, *Pearson*

3080 (BM, K); between Grouwater and Klipplaat, XII. 1908, *Pearson* 3282 (A, BM, K, S); Schurkraal, XII. 1908, *Pearson* 4999 (A, K, N). Van Rhynsdorp distr.: Between Kamiesberg and Nieuwfontein, *Drège* (2545) (B, BM, G, K, N, W). Clanwilliam distr.: Between Builshoek and Doorn River, XI. 1910, *Pearson* 5400 (K); Olifants River valley, XII. 1936, *Adamson* 1556 (N). Ceres distr.: Papekuil, XI. 1908, *Pearson* 3991 (A, BH, BM, K, N, S). Sutherland distr.: Roggeveld, Korhaan's Kloof, *Rehmann* 3187 (B, Z). Laingsburg distr.: At Matjesfontein, *Rehmann* 2910 (BM, K, V, Z). Prince Albert distr.: Fraserburg Road, I. 1903, *Marloth* 3056 (N); by the Gamka River, *Mundt et Maire* s.n. (K). Jansenville distr.: Jansenville, *Joseph* 8639 (N); Klipplaatrivier, *Drège* 3924 (B, G, P). Graaff-Reinet distr.: Near Riviërtjie, III. 1869, *Bolus* 1981 (BH, K, Z). Murraysburg distr.: Murraysburg, VII. 1878, *Tyson* 558 (D) et XII. 1878, *Tyson* 258 (BH). Middelburg distr.: Grootfontein, IV. 1911, *Pillans* 1854 (K). Fraserburg distr.: Williston, XI. 1921, *Foley* 189 (N) et II. 1926, *Smith* 2457 (N). Carnarvon distr.: Nieuweveld, between Brakrivier and Uitvlugt, *Drège* (B, G, O, P, S, V). Prieska distr.: Prieska, III. 1931, *Bryant* 604 (B, K, W) et II. 1932, *Bryant* 650 (K, N) et *Bryant* 4147 (Mc). Hay distr.: Griquatown, XII. 1811, *Burchell* 1885 (G, K, P) et XII. 1894, *Marloth* 2093 (N, St); Krom Aar, III. 1921, *Wilman* 2457 (K, Mc); Black Ridge, III. 1934, *Wilman* 3059 (BH, Mc); Niekerks Hoop, X. 1936, *Hafstrom* 1335 (K, Mc). Gordonias distr.: Upington, IV. 1923, *Borchers* H. 21456 (N) et V. 1923, *Borchers* H. 21495 (K) et H. 21455 (W); do., VII. 1925, *Barnard* 36143 (S); Witkop, X. 1937, *Webb* 17 (N); Zwart Puts, X. 1911 *Wilman* s.n. (K). Without precise locality: *Ecklon et Zeyher* (A, K, N); *Mundt* s.n., (B); *Pappe* s.n. (BM); *Burke et Zeyher* (O); *Buchanan* s.n. (S).

TYPE SPECIMEN.

The type is deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAMES.

Bamboo Aristida. Bamboo grass. Hay grass. Heidegras. Hooigras. Stechgras. Steekgras. Steekriet. Steekweek.

ECONOMIC NOTES.

This species is reported to be of value as a sandstay and thus may prove useful in combating erosion. Although the foliage is very coarse and prickly, *Pearson* states that it is "much eaten by stock" whereas *Pillans* states that it "does not provide grazing". It is furthermore occasionally used for thatching.

5. **A. Schlechteri** *Henrard* Crit. Rev. **3**. 541 (1928); *Henrard* Monogr. **1**. 40 et 51 cum ic. tab. 1 (1929).

A hybrid between *A. capensis* Thunb. and *A. ciliata* Desf. var. *capensis* Trin. et Rupr. and agreeing in vegetative characters with the former. Caespitose perennial. Culms up to 40 cm. high, but sometimes much shorter, 2-noded. Internodes exserted, terete, somewhat striate, glabrous; nodes ciliate with spreading white hairs. Leaf-sheaths tight, striate, glabrous. Ligule a ciliolate rim; auricles bearded, collar glabrous. Leaves mostly basal, rather short, up to 14 cm. long, but usually about 6 cm. long, flexuous and curved, subrigid, setaceous, convolute, striate and glabrous below, hairy above. Panicle exserted, strictly erect, few-flowered; branches erect or ascending, scaberulous or smooth; pedicels slightly scabrous, spikelets lanceolate. Glumes firm and chartaceous, 3-nerved, yellowish, purple-flushed at the base, subequal to unequal, acute or subobtusely with minutely ciliolate tips; the lower 11-13.5 mm. long; the upper 13-16 mm. long. Articulation of the lemma 7-7.5 mm. from the base of the callus. Lemma smooth. Callus very acute, hairy, about 2-2.25 mm. long. Column of awns slightly to strongly twisted, about 7-9 mm. long, glabrous. Central awn 3.5-4 cm. long, feathery all along to the very tip, obtuse in outline; lateral awns 1.8-2.6 cm. long, naked or sparingly plumose, often one of these plumose and the other naked, tips long-exserted, rather fine.

CAPE PROVINCE.

Little Namaqualand distr.: Windhoek, VII., 1896, *Schlechter* 8338 (A, B, BH, G, K, N, P, T, V, W, Z).

REMARKS.

Henrard states the position of the articulation to be variable, but I have made many measurements and found this variation negligible. The articulation is situated 7-7.5 mm. from the end of the callus. It is moreover the length of the column of the lemma which shows some variation (7-9 mm.), and this is probably due to the discrepancies which Henrard mentions in regard to the position of the articulation. The length of the column of the lemma is usually fairly variable even in spikelets of one and the same panicle. See also *A. subacaulis* where the length of the column is extremely variable.

6. *A. ciliata* Desf. var. *capensis* Trin. et Rupr. \times *A.* ?

The number cited below consists of two sheets which undoubtedly represents a hybrid.

The plants superficially resemble *A. ciliata* Desf. var. *capensis* Trin. et Rupr. as the nodes are strongly ciliate with reflexed or spreading white hairs, the glumes are subequal, obtuse or truncate, and minutely ciliate at their apices, and they are furthermore slightly discoloured (purple?) at the base. The lemmas however disagree with the aforementioned species as the callus shows a great deal of variation in its degree of hairiness. It shows all intermediates from being densely bearded to being perfectly glabrous. The body of the lemma may show the presence of an articulation as in typical members of § *Schistachne*. The majority of lemmas however show no signs of an articulation and in this respect they agree with members placed in § *Chaetaria*. All three awns of the lemma are plumose and acute in outline. The awns are fairly rigid and have almost naked exerted tips, and in this respect are not unlike those of *A. capensis* Thunb. There are, however, no other characters which would suggest a relationship with the last-mentioned species. Owing to the plumose awns this hybrid bears some resemblance to *A. sericans* Hack. but differs from the latter in a number of important characters, viz. bearded nodes, obtuse and glabrous glumes, etc. To suggest *A. sericans* Hack. as the other parent is unwarranted since the former appears to be restricted to the High Veld area of the Transvaal and therefore almost certainly does not occur in the dry arid regions of the Kenhardt District.

CAPE PROVINCE.

Kenhardt distr.: Loog Kolk, X. 1928, *Pole Evans* 43 (N).

7. *A. ciliata* Desf. var. *capensis* Trin. et Rupr. Spec. Gram. Stip. 164 (1842); Walp. Ann. Bot. 3. 748 (1852); Dur. et Schinz, Consp. 5. 802 (1894); Dinter in Fedde, Rep. 15. 341 (1918); Henrard Crit. Rev. 1. 93 (1926); Henrard Monogr. 1. 43 cum ic. tab. 2 (1929).

A. ciliata Desf. sec. Kunth, Enum. 1. 195 (1833); Steud. Syn. Pl. Glum. 1. 143 (1854) pro parte; Dur. et Schinz, Consp. 5. 802 (1894) pro parte; Hack, in Bull. Herb. Boiss. 4. Append. III. 17 (1896); Stapf in Dyer, Fl. Cap. 7. 563 (1899) pro parte; F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915) pro parte; Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925); Range in Fedde, Rep. 33. 8 (1933) pro parte, omnes non Desf.

A. centrifuga Burchell, Travels 1. 266 (1822) nomen tantum. *A. obtusa* Del. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915) pro parte, non Del. *A. piligera* Burchell ex Schult. Mant. 2. 478 (1824); Kunth, Enum. 1. 197 (1833). *A. pubigena* Burchell, Travels 1. 288 (1822). *Arthratherum ciliatum* Nees in Linnaea 7. 289 (1832). *Arthratherum Schimperii* Nees, Fl. Afr. Austr. 178 (1841); Presl, Bot. Bemerk. 121 (1844).

Perennial, compactly caespitose, branched from near the base. Innovations forming dense tufts. Culms up to 85 cm. high but usually much shorter, densely tufted, fascicled, erect or somewhat geniculately ascending from a well-developed rootstock, simple, 2-3-noded; internodes terete, nearly smooth, with a viscous ring below the nodes, slightly

striate, somewhat swollen near the nodes, exserted; *nodes long-bearded with spreading hairs, the hairs often deciduous in old culms*. Lower leaf-sheaths crowded at the base, very broad, pallid or whitish, firm and persistent, striate, glabrous or more or less woolly along the margins; upper leaf-sheaths tight, shorter than the internodes, striate, glabrous or slightly pubescent; *ligule* a short ciliate rim, auricles shortly ciliate, those of the innovations conspicuously bearded; collar glabrous; *blades* striate, glabrous and smooth beneath, minutely hairy or hirtellous on the upper surface, convolute throughout, coarsely setaceous to pungent (when short) more or less recurved, variable in length, up to 25 cm. long but usually very much shorter. *Panicle* exserted, up to 30 cm. long, narrow but open and sometimes very loose, usually contracted and erect; axis terete or subcompressed, at times striate, glabrous; branches filiform, erect or sub-erect, solitary or usually 2-3-nate, up to about 8 cm. long exclusive of the awns, often branched from near the base; pedicels glabrous, shorter to longer than the glumes, clavate at the apex. *Spikelets* linear-oblong, pale or straw-coloured, often suffused with purple at the base. *Glumes* subequal, linear-oblong, 3-nerved, glabrous, obtuse or subacute, very firm, emarginate and usually minutely ciliate at the apex; the lower from 8.5-11 mm. long, the upper 9-12 mm. long. *Lemma* tubulous, glabrous, smooth, gradually narrowed into a slender, twisted column of a somewhat variable length, articulated 5-7 mm. from the base of the callus, 10.5-14 mm. long up to the branching-point of the awn; *callus* long-hairy, very acute, from 1.5-2.5 mm. long; central awn 4-5 cm. long, naked in lower quarter, feathery part obtuse in outline, with a short naked or minutely plumose exserted tip; lateral awns very fine, usually sub-erect, 1.5-2.5 cm. long, sometimes slightly but inconspicuously plumose in their upper part. *Anthems* 5-5.5 mm. long.

SOUTH WEST AFRICA.

Witvley, III. 1911, *Dinter* 1972 (B); Walfishbay, *Nachtigal* 7 (B); Salzbrunn, IV. 1913, *Engler* 6560 (B); between Dabaigabis and Gründoorn, II. 1909, *Pearson* 3159 (BM, S); between Ausis and Khuias, III. 1885, *Schenck* 218 (N, V, Z); Kunguigebirge, *Range* 1064 (B); Haalenberg, IV. 1929, *Dinter* 6302 (B, BH); Keetmanshoop, 1897, *Seidel* 1 (B); Mount Brukkaros, IV. 1927, *Sordahl* 38 pro parte (B, BM, W); Angra Pequena, I. 1907, *Galpin et Pearson* 7522 pro parte (N); Angra Pequena, VII. 1925, *Moss* 11516 (W) et 11517 (K, WR); do., X. 1884, *Schenck* 1a (Z); do., 1884, *Schinz* 668 (Z) et 669 (Z); do., IV. 1886, *Marloth* 1158 (B) et 4742 (N); Rotkuppe, II. 1909, *Pearson* 4183 (K); Garub, X. 1910, *Marloth* 5001 (N, St); do., X. 1907, *Range* 522 (B); prope Aus, 1885, *Schinz* 667 (Z, V); Kubub, II. 1907, *Range* 222 (B); Kuibis, *Range* 890 (B); do., I. 1909, *Range* 654 (B); Buchholzbrunn, II. 1909, *Pearson* 3638 (BH); Sandverhaar, II. 1909, *Pearson* 4663 pro parte (BH); Inachab, XII. 1897, *Dinter* 1104 (B, Z); Klein Karas, IV. 1931, *Örtendahl* 120 (B, K, N); do., IX. 1923, *Dinter* 5000 pro parte (N); Holoog, I. 1916, *Pearson* 9811 (K); Anibebene, 1895, *Schinz* 326 (Z); Klinghardtgebirge, VIII. 1913, *Schäfer* 548 (B) et 513 (B); Great Karasberg, 1918, *Blank* 63 (B); do., Kraaikluft, I. 1913, *Pearson* 8496 (N); near Sendlingsdrift, *Range* 1556 (B); 25 Km. north of Warmbad, II. 1909, *Pearson* 4301 (BH, N); north of Ganus, II. 1909, *Pearson* 4495 (K, T); Viols Drift, IX. 1931, *Pillans* 6395 (BH); without precise locality: Namib, *Boss* TM. 36281 (T) et *Morgenstern* 31 (B, W); Walfishbay-Otyitambi, *Lüderitz* 34 (B); *Range* 1423 (B).

CAPE PROVINCE.

Little Namaqualand distr.: Near mouth of Orange River, *Drège* 2548 (B, BM, G, K, N, O, P, S, V); Groot Derm, X. 1926, *Pillans* 5230 (BH); between Arris Drift and Anisfontein, X. 1926, *Pillans* 5247 (BH); near Bethany Drift, XII. 1910, *Pearson* 6952 (K); Richtersveld, IX. 1925, *Marloth* 12414 (N); do., VIII. 1925, *Marloth* 12309 (N); near Oograbies, I. 1909, *Pearson* 3564 (A, K, T); between Wolftoon and Henkriesfontein, I. 1909, *Pearson* 3107 (A); Goodhouse, IX. 1930, *Henrici* 2221 (N); Henkries, XI. 1897, *Schlechter* 10 (B, BH, BM, G, K, N, P, T, W); Lekkersing, IX. 1936, *Taylor* 1096 (N); Buffelrivier, IX. 1897, *Schlechter* 11257 (A, B, BH, BM, G, K, N, P, V, W, Z); Kamiesberg, *Zeyher* 74 (V). Calvinia distr.: between Losper's Plaats and Springbokkuil, *Zeyher* 1812

woolly lower margins, and bearing reduced deciduous spinelike blades. *Culms* fascicled, ascending or prostrate, woody below, simple or usually with fascicles of erect branches from the lower or the middle nodes, at times very long and reaching a height of 2 meters (*Bryant*), glabrous and smooth. *Sheaths* very tight, firm, pallid, glabrous, striate or smooth, more rarely more or less hairy, longer or slightly shorter than the internodes; *ligules* and *auricles* minutely ciliate only; collar smooth; *blades* setaceous or subulate, convolute, the lower very short, very rigid and pungent, the upper longer, up to 25 cm. long, glaucous, glabrous, smooth on the lower surface, hispidulous on the upper surface. *Panicle* more or less exserted, narrow, linear, more or less contracted but rather loose, up to 30 cm. long or usually shorter; rhachis straight or subflexuous, nearly smooth, branches solitary, nearly sessile, erect or suberect, bipartite nearly from the base, or the branchlets fascicled, the lower ones up to 7.5 cm. long, scabrous and filiform like the branchlets, lateral spikelets with branches much shorter than the glumes. *Spikelets* yellowish, pallid, erect. *Glumes* rather firm, unequal, lanceolate to linear-lanceolate, acuminate, tips minutely truncate or slightly bifid, 3-nerved, glabrous, involute, the lower 8–13 mm. long, the upper 9.5–15 mm. long. *Lemma* subcylindric, glabrous, produced into a straight or somewhat twisted short beak, the body articulated 2.5–5 mm. below the branching-point of the awns, total length of lemma and column 8–11 mm; *callus* conical 1.5–2 mm. long, acute and pointed, hairy. *Awns* somewhat unequal and variable in length; the central from 11–25 mm. long, the lateral from 8–18 mm. long, all the awns plumose to the very tips, the central subobtusate and the lateral subacute in outline, the side bristles finer than the central awn and scantily adpressedly plumose at the base, more densely so above. *Pale* broad, about 1.5 mm. long, nerveless. *Lodicules* 1 mm. long, few-nerved. *Anthers* 4.5 mm. long.

SOUTH-WEST AFRICA.

Omuvaruma river, XII. 1938, *Volk* 403 (D); below Ababes, Tsondab River, XII. 1915, *Pearson* 9155 (K, S); Haikamchab, I. 1907, *Galpin et Pearson* 7426 (BH, K, N, P, S); Awas mountains, I. 1916, *Pearson* 9646 (S); between Choaberib and Gurumanes, I. 1916, *Pearson* 9416 (K); Rehoboth, XII. 1890, *Fleck* 21a (Z); between Zendlingsgrab and Kub, III. 1905, *Von Trotha* 22 (B); Orab, *Dinter* 2027 (B, W); Gründoorn, VI. 1931, *Oertendahl* 334b (K, N); Khamis, Riverbed of Konkip, *Schultze* 471 (B); Beersheba, I. 1931, *Sordahl* 44 (BM, W); Kunguiberge, *Range* 1062 (B); Lüderitzbucht, *Schäfer* 377 (B); Rotkuppe Station, II. 1909, *Pearson* 4189 (A, D, K, S); 18 KM west of Aus, II. 1909, *Pearson* 4203 (BH, K); Aus, *Schenck* 171 (Z); West of Aus, II. 1909, *Pearson* 4206 (K) et 4208 (K) et 4217 (A, K); Buchholzbrunn, riverbed, II. 1909, *Pearson* 3644 (K) et 3645 (BH, K); Sandverhaar, II. 1909, *Pearson* 3710 (K, Z) et 3713 (BH, D, K, N) et 4343 (BH, K, N); Sandverhaar, I. 1910, *Schäfer* 284 (B); Inachab, XII. 1897, *Dinter* 1108 (Z); Great Karasberg, XII. 1912, *Pearson* 8078 (B, K) et I. 1913, *Pearson* 8497 (BH, BM, K, S, Z); Holoog, I. 1916, *Pearson* 9714 (B, K, S) et 9745 (BH, K, S); Kanus, I. 1910, *Range* 899 (B); Khanibes, Horos, X. 1907, *Hartmann* 14 (B); Gabis, I. 1909, *Pearson* 4324 (K); 20 KM north of Raman's Drift, I. 1909, *Pearson* 4532 (K, S); Warmbad, 1888, *Wandres* 28 (Z); without precise locality: *Wyley* s.n. (V); *Dinter* 6413 (G); *Range* 748 (B) et 96 (B).

CAPE PROVINCE.

Little Namaqualand distr.: Between Arris Drift and Arnisfontein, X. 1926, *Pillans* 5322 (K); Lekkersing, IX. 1935, *Taylor* 1083 (N); Eenriet, I. 1909, *Pearson* 3082 (K); South of Brakfontein, X. 1926, *Pillans* 5565 (BH); Aggenys, I. 1909, *Pearson* 2947 (K, N); between Arkoep and Mesklip, XII. 1910, *Pillans* 5898 (BM, K, N, S); Kamabies, XII. 1908, *Pearson* 3953 (BH, K); Kamiesberg, *Zeyher* 74 (B, G, V, W, Z); Alewynsfontein, XII. 1908, *Pearson* 3335 (K); between Plaatklip and Bitterfontein, I. 1908, *Pearson* 3298 (A, D, K, S). Calvinia distr.: At Kamos, Komseep, Springbokkuil and Lospers Plaats, *Zeyher* 1814 (A, BH, BM, G, K, N, P, S, V, Z); Brakrivier, XII. 1908, *Pearson* 3901 (K); Doornriver, XII. 1908, *Pearson* 3883 (BM, N, T); near Schurkraal, XII. 1908, *Pearson*

3080 (BM, K); between Grouwater and Klipplaat, XII. 1908, *Pearson* 3282 (A, BM, K, S); Schurkraal, XII. 1908, *Pearson* 4999 (A, K, N). Van Rhynsdorp distr.: Between Kamiesberg and Nieuwfontein, *Drège* (2545) (B, BM, G, K, N, W). Clanwilliam distr.: Between Builshoek and Doorn River, XI. 1910, *Pearson* 5400 (K); Olifants River valley, XII. 1936, *Adamson* 1556 (N). Ceres distr.: Papekuil, XI. 1908, *Pearson* 3991 (A, BH, BM, K, N, S). Sutherland distr.: Roggeveld, Korhaan's Kloof, *Rehmann* 3187 (B, Z). Laingsburg distr.: At Matjesfontein, *Rehmann* 2910 (BM, K, V, Z). Prince Albert distr.: Frasierburg Road, I. 1903, *Marloth* 3056 (N); by the Gamka River, *Mundt et Maire* s.n. (K). Jansenville distr.: Jansenville, *Joseph* 8639 (N); Klipplaatrivier, *Drège* 3924 (B, G, P). Graaff-Reinet distr.: Near Riviërtjie, III. 1869, *Bolus* 1981 (BH, K, Z). Murraysburg distr.: Murraysburg, VII. 1878, *Tyson* 558 (D) et XII. 1878, *Tyson* 258 (BH). Middelburg distr.: Grootfontein, IV. 1911, *Pillans* 1854 (K). Frasierburg distr.: Williston, XI. 1921, *Foley* 189 (N) et II. 1926, *Smith* 2457 (N). Carnarvon distr.: Nieuweveld, between Brakrivier and Uitvlugt, *Drège* (B, G, O, P, S, V). Prieska distr.: Prieska, III. 1931, *Bryant* 604 (B, K, W) et II. 1932, *Bryant* 650 (K, N) et *Bryant* 4147 (Mc). Hay distr.: Griquatown, XII. 1811, *Burchell* 1885 (G, K, P) et XII. 1894, *Marloth* 2093 (N, St); Krom Aar, III. 1921, *Wilman* 2457 (K, Mc); Black Ridge, III. 1934, *Wilman* 3059 (BH, Mc); Niekerks Hoop, X. 1936, *Hafstrom* 1335 (K, Mc). Gordonias distr.: Upington, IV. 1923, *Borchers* H. 21456 (N) et V. 1923, *Borchers* H. 21495 (K) et H. 21455 (W); do., VII. 1925, *Barnard* 36143 (S); Witkop, X. 1937, *Webb* 17 (N); Zwart Puts, X. 1911 *Wilman* s.n. (K). Without precise locality: *Ecklon et Zeyher* (A, K, N); *Mundt* s.n. (B); *Pappe* s.n. (BM); *Burke et Zeyher* (O); *Buchanan* s.n. (S).

TYPE SPECIMEN.

The type is deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAMES.

Bamboo Aristida. Bamboo grass. Hay grass. Heidegras. Hooigras. Stechgras. Steekgras. Steekriet. Steekkweek.

ECONOMIC NOTES.

This species is reported to be of value as a sandstay and thus may prove useful in combating erosion. Although the foliage is very coarse and prickly, *Pearson* states that it is "much eaten by stock" whereas *Pillans* states that it "does not provide grazing". It is furthermore occasionally used for thatching.

5. **A. Schlechteri** *Henrard* Crit. Rev. **3**. 541 (1928); *Henrard* Monogr. **1**. 40 et 51 cum ic. tab. 1 (1929).

A hybrid between *A. capensis* Thunb. and *A. ciliata* Desf. var. *capensis* Trin. et Rupr. and agreeing in vegetative characters with the former. Caespitose perennial. Culms up to 40 cm. high, but sometimes much shorter, 2-noded. Internodes exserted, terete, somewhat striate, glabrous; nodes ciliate with spreading white hairs. Leaf-sheaths tight, striate, glabrous. Ligule a ciliate rim; auricles bearded, collar glabrous. Leaves mostly basal, rather short, up to 14 cm. long, but usually about 6 cm. long, flexuous and curved, subrigid, setaceous, convolute, striate and glabrous below, hairy above. Panicle exserted, strictly erect, few-flowered; branches erect or ascending, scaberulous or smooth; pedicels slightly scabrous, spikelets lanceolate. Glumes firm and chartaceous, 3-nerved, yellowish, purple-flushed at the base, subequal to unequal, acute or subobtusate with minutely ciliate tips; the lower 11-13.5 mm. long; the upper 13-16 mm. long. Articulation of the lemma 7-7.5 mm. from the base of the callus. Lemma smooth. Callus very acute, hairy, about 2-2.25 mm. long. Column of awns slightly to strongly twisted, about 7-9 mm. long, glabrous. Central awn 3.5-4 cm. long, feathery all along to the very tip, obtuse in outline; lateral awns 1.8-2.6 cm. long, naked or sparingly plumose, often one of these plumose and the other naked, tips long-exserted, rather fine.

CAPE PROVINCE.

Little Namaqualand distr.: Windhoek, VII., 1896, *Schlechter* 8338 (A, B, BH, G, K, N, P, T, V, W, Z).

REMARKS.

Henrard states the position of the articulation to be variable, but I have made many measurements and found this variation negligible. The articulation is situated 7-7.5 mm. from the end of the callus. It is moreover the length of the column of the lemma which shows some variation (7-9 mm.), and this is probably due to the discrepancies which Henrard mentions in regard to the position of the articulation. The length of the column of the lemma is usually fairly variable even in spikelets of one and the same panicle. See also *A. subacaulis* where the length of the column is extremely variable.

6. *A. ciliata* Desf. var. *capensis* Trin. et Rupr. \times *A.* ?

The number cited below consists of two sheets which undoubtedly represents a hybrid.

The plants superficially resemble *A. ciliata* Desf. var. *capensis* Trin. et Rupr. as the nodes are strongly ciliate with reflexed or spreading white hairs, the glumes are subequal, obtuse or truncate, and minutely ciliate at their apices, and they are furthermore slightly discoloured (purple?) at the base. The lemmas however disagree with the aforementioned species as the callus shows a great deal of variation in its degree of hairiness. It shows all intermediates from being densely bearded to being perfectly glabrous. The body of the lemma may show the presence of an articulation as in typical members of § *Schistachne*. The majority of lemmas however show no signs of an articulation and in this respect they agree with members placed in § *Chaetaria*. All three awns of the lemma are plumose and acute in outline. The awns are fairly rigid and have almost naked exerted tips, and in this respect are not unlike those of *A. capensis* Thunb. There are, however, no other characters which would suggest a relationship with the last-mentioned species. Owing to the plumose awns this hybrid bears some resemblance to *A. sericans* Hack. but differs from the latter in a number of important characters, viz. bearded nodes, obtuse and glabrous glumes, etc. To suggest *A. sericans* Hack. as the other parent is unwarranted since the former appears to be restricted to the High Veld area of the Transvaal and therefore almost certainly does not occur in the dry arid regions of the Kenhardt District.

CAPE PROVINCE.

Kenhardt distr.: Loog Kolk, X. 1928, *Pole Evans* 43 (N).

7. *A. ciliata* Desf. var. *capensis* Trin. et Rupr. Spec. Gram. Stip. 164 (1842); Walp. Ann. Bot. 3. 748 (1852); Dur. et Schinz, Consp. 5. 802 (1894); Dinter in Fedde, Rep. 15. 341 (1918); Henrard Crit. Rev. 1. 93 (1926); Henrard Monogr. 1. 43 cum ic. tab. 2 (1929).

A. ciliata Desf. sec. Kunth, Enum. 1. 195 (1833); Steud. Syn. Pl. Glum. 1. 143 (1854) pro parte; Dur. et Schinz, Consp. 5. 802 (1894) pro parte; Hack, in Bull. Herb. Boiss. 4. Append. III. 17 (1896); Stapf in Dyer, Fl. Cap. 7. 563 (1899) pro parte; F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915) pro parte; Garsbedian in Ann. S. Afr. Mus. 16. II. 401 (1925); Range in Fedde, Rep. 33. 8 (1933) pro parte, omnes non Desf.

A. centrifuga Burchell, Travels 1. 266 (1822) nomen tantum. *A. obtusa* Del. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915) pro parte, non Del. *A. piligera* Burchell ex Schult. Mant. 2. 478 (1824); Kunth, Enum. 1. 197 (1833). *A. pubigena* Burchell, Travels 1. 288 (1822). *Arthratherum ciliatum* Nees in Linnaea 7. 289 (1832). *Arthratherum Schimperii* Nees, Fl. Afr. Austr. 178 (1841); Presl, Bot. Bemerk. 121 (1844).

Perennial, compactly caespitose, branched from near the base. Innovations forming dense tufts. Culms up to 85 cm. high but usually much shorter, densely tufted, fascicled, erect or somewhat geniculately ascending from a well-developed rootstock, simple, 2-3-noded; internodes terete, nearly smooth, with a viscous ring below the nodes, slightly

striate, somewhat swollen near the nodes, exserted; *nodes long-bearded with spreading hairs, the hairs often deciduous in old culms*. Lower leaf-sheaths crowded at the base, very broad, pallid or whitish, firm and persistent, striate, glabrous or more or less woolly along the margins; upper leaf-sheaths tight, shorter than the internodes, striate, glabrous or slightly pubescent; *ligule* a short ciliate rim, auricles shortly ciliate, those of the innovations conspicuously bearded; collar glabrous; *blades* striate, glabrous and smooth beneath, minutely hairy or hirtellous on the upper surface, convolute throughout, coarsely setaceous to pungent (when short) more or less recurved, variable in length, up to 25 cm. long but usually very much shorter. *Panicle* exserted, up to 30 cm. long, narrow but open and sometimes very loose, usually contracted and erect; axis terete or subcompressed, at times striate, glabrous; branches filiform, erect or sub-erect, solitary or usually 2-3-nate, up to about 8 cm. long exclusive of the awns, often branched from near the base; pedicels glabrous, shorter to longer than the glumes, clavate at the apex. *Spikelets* linear-oblong, pale or straw-coloured, often suffused with purple at the base. *Glumes* subequal, linear-oblong, 3-nerved, glabrous, obtuse or subacute, very firm, emarginate and usually minutely ciliolate at the apex; the lower from 8.5-11 mm. long, the upper 9-12 mm. long. *Lemma* tubulose, glabrous, smooth, gradually narrowed into a slender, twisted column of a somewhat variable length, articulated 5-7 mm. from the base of the callus, 10.5-14 mm. long up to the branching-point of the awn; *callus* long-hairy, very acute, from 1.5-2.5 mm. long; central awn 4-5 cm. long, naked in lower quarter, feathery part obtuse in outline, with a short naked or minutely plumose exserted tip; lateral awns very fine, usually sub-erect, 1.5-2.5 cm. long, sometimes slightly but inconspicuously plumose in their upper part. *Anthers* 5-5.5 mm. long.

SOUTH WEST AFRICA.

Witvley, III. 1911, *Dinter* 1972 (B); Walfishbay, *Nachtigal* 7 (B); Salzbrunn, IV. 1913, *Engler* 6560 (B); between Dabaigabis and Gründoorn, II. 1909, *Pearson* 3159 (BM, S); between Ausis and Khuias, III. 1885, *Schenck* 218 (N, V, Z); Kunguibgebirge, *Range* 1064 (B); Haalenberg, IV. 1929, *Dinter* 6302 (B, BH); Keetmanshoop, 1897, *Seidel* 1 (B); Mount Brukkaros, IV. 1927, *Sordahl* 38 pro parte (B, BM, W); Angra Pequena, I. 1907, *Galpin et Pearson* 7522 pro parte (N); Angra Pequena, VII. 1925, *Moss* 11516 (W) et 11517 (K, WR); do., X. 1884, *Schenck* 1a (Z); do., 1884, *Schinz* 668 (Z) et 669 (Z); do., IV. 1886, *Marloth* 1158 (B) et 4742 (N); Rotkuppe, II. 1909, *Pearson* 4183 (K); Garub, X. 1910, *Marloth* 5001 (N, St); do., X. 1907, *Range* 522 (B); prope Aus, 1885, *Schinz* 667 (Z, V); Kubub, II. 1907, *Range* 222 (B); Kuibis, *Range* 890 (B); do., I. 1909, *Range* 654 (B); Buchholzbrunn, II. 1909, *Pearson* 3638 (BH); Sandverhaar, II. 1909, *Pearson* 4663 pro parte (BH); Inachab, XII. 1897, *Dinter* 1104 (B, Z); Klein Karas, IV. 1931, *Örtendahl* 120 (B, K, N); do., IX. 1923, *Dinter* 5000 pro parte (N); Holoog, I. 1916, *Pearson* 9811 (K); Anibebene, 1895, *Schinz* 326 (Z); Klinghardtgebirge, VIII. 1913, *Schäfer* 548 (B) et 513 (B); Great Karasberg, 1918, *Blank* 63 (B); do., Kraaikluft, I. 1913, *Pearson* 8496 (N); near Sendlingsdrift, *Range* 1556 (B); 25 Km. north of Warmbad, II. 1909, *Pearson* 4301 (BH, N); north of Ganus, II. 1909, *Pearson* 4495 (K, T); Viols Drift, IX. 1931, *Pillans* 6395 (BH); without precise locality: Namib, *Boss* TM. 36281 (T) et *Morgenstern* 31 (B, W); Walfishbay-Otyitambi, *Lüderitz* 34 (B); *Range* 1423 (B).

CAPE PROVINCE.

Little Namaqualand distr.: Near mouth of Orange River, *Drège* 2548 (B, BM, G, K, N, O, P, S, V); Groot Derm, X. 1926, *Pillans* 5230 (BH); between Arris Drift and Anisfontein, X. 1926, *Pillans* 5247 (BH); near Bethany Drift, XII. 1910, *Pearson* 6952 (K); Richtersveld, IX. 1925, *Marloth* 12414 (N); do., VIII. 1925, *Marloth* 12309 (N); near Oograbies, I. 1909, *Pearson* 3564 (A, K, T); between Wolftoon and Henkriesfontein, I. 1909, *Pearson* 3107 (A); Goodhouse, IX. 1930, *Henrici* 2221 (N); Henkries, XI. 1897, *Schlechter* 10 (B, BH, BM, G, K, N, P, T, W); Lekkersing, IX. 1936, *Taylor* 1096 (N); Buffelrivier, IX. 1897, *Schlechter* 11257 (A, B, BH, BM, G, K, N, P, V, W, Z); Kamiesberg, *Zeyher* 74 (V). Calvinia distr.: between Losper's Plaats and Springbokkuil, *Zeyher* 1812

(A, BH, G, K, N, P, S, Z); between Plaatklip and Bitterfontein, XII. 1908, *Pearson* 3293 (K, N); south of Klipplaat, XII. 1908, *Pearson* 3395 (BM, N, S); between Pappekuil and Stompiesfontein, XII. 1908, *Pearson* 4967 (A, BM). Clanwilliam distr.: Klaver, III. 1926, *Smith* 2600 (N); Ceres distr.: Gansfontein, XII. 1908, *Pearson* 3983 (BH, K). Beaufort West distr.: Between Dweka and Zwartbulletje, *Drège* (B, G, P, S). Fraserburg distr.: Between Patrysfontein and Great Brakriver, IX. 1811, *Burchell* 1521 (K). Prince Albert distr.: Prince Albert, XII. 1906, *Bolus* 12432 (B, BH, BM, K, N); Prince Albert Road, V. 1920, *Pillans* 7060 (BH); Jakalsfontein, *Burke* 22 (K); Gamka River, *Mundt (et Maire)* (B, G, K). Murraysburg distr.: Murraysburg, *Tyson* 280 (BH). Uitenhage distr.: Uitenhage?, *Prior* s.n. (K, S, V). Somerset East distr.: Somerset, *Bowker* s.n. (K). Middelburg distr.: Grootfontein, IV. 1911, *Pillans* 1855 (K). Victoria West distr.: Victoria West, *Schweitzer* s.n. (A). Prieska distr.: Between Modderfontein and Keikamapoort, *Burchell* 1612-4 (K); Prieska, III. 1931, *Bryant* 607 (B, K, W); do., VIII. 1918, *Pole Evans* H. 18800 (N). Kimberley distr.: Kudusberg, VI. 1936, *Wilman* 3532 (K, Mc). Hay distr.: Niekerk's Hoop, X. 1936, *Hafstrom* 1332 (Mc); Griquatown, anno 1928, *Conradie* 1 (St). Mafeking distr.: Mafeking, IV. 1929, *Pole Evans* 2404 (N). Gordonias distr.: Upington, VIII. 1912, *McDonald* H. 8132 (K, N, T); do., IV. 1923, *Borchers* H. 21455 (K, N); Springboksvlei, XI. 1936, *Webb* 22 (N); Narougas, VII. 1925, *Barnard* 36145 (S). Without precise locality: *Pappe* s.n. (BM); *Zeyher* 1809 (BM); *Wyley* s.n. (V); *Marloth* 3718 (K, N) et 3727 (N).

ORANGE FREE STATE.

Bloemfontein distr.: Near Bloemfontein, IV. 1928, *Pole Evans* 2190 (N).

TYPE SPECIMEN.

Drège from Dweka and Zwartbulletje is deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAMES.

Bushman Grass. Dwa-gras. Groot Boesmangras. Grosses Toagras. Habugras. Kortbeen Twaa. Langbeen Twaa. Ochsengras. Tall Bushman Grass. Toagras.

ECONOMIC NOTES.

This species is considered a very good stock food, it is eagerly grazed by both sheep and cattle. It is said to be very drought-resistant, persists many months without rain and flowers readily after a minimum of rain.

7A. *A. ciliata* Desf. var. *villosa* Hack. in Bull. Herb. Boiss. 4 Append. III. 18 (1896); Stapf in Dyer, Fl. Cap. 7. 564 (1899); Dinter in Fedde, Rep. 15. 341 (1918); Henrard Crit. Rev. 1. 95 (1926); Henrard Monogr. 1. 42 (1929); Theron in Fedde, Rep. 40. 10 (1936).

A. ciliata Desf. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915) pro parte; Range in Fedde, Rep. 33. 8 (1933) pro parte, non Desf. *A. prodigiosa* Welw. sec. Garabedian in Ann. S. Afr. Mus. 16. II. 404 (1925) pro parte, non Welw.

This variety may be readily recognised by the possession of densely lanate or villous leaf-sheaths and leaf-blades. It appears to occur only in the very arid regions of South West Africa.

SOUTH WEST AFRICA.

Olukonda, XII. 1885, *Schinz* 649 (Z); Haikamchab, I. 1907, *Galpin et Pearson* 7413 (K, N, S); Marienthal-Orab, III. 1911, *Dinter* 2013 (B); Bei Lüderitzbucht, IX. 1913, *Range* 1883 (B); Angra Pequena, 1884, *Schinz* 663 (Z); do., I. 1907, *Galpin et Pearson* 7522 pro parte (K, S); Klinghardtgebirge, VIII. 1913, *Schäfer* 546 (B); Schakalskuppe, II. 1909, *Pearson* 4800 (K); between Aos and the Orange River, III. 1885, *Schenck* 327 (N, V, Z); Buntfeldschuh, IX. 1922, *Dinter* 3922 (B, N); North of Warmbad, II. 1909, *Pearson* 4301 (D, K).

TYPE SPECIMEN.

Schenck 327 both in the Botanisches Museum, Zürich and in the Naturhistorisches Museum, Wien.

ECONOMIC NOTES.

This variety is considered a good fodder grass for cattle and horses.

7b. *A. ciliata* Desf. var. *pectinata* Henr. Crit. Rev. 1. 95 (1926); Henrard Monogr. 1. 42 (1929); Theron in Fedde, Rep. 40. 10 (1936).

This variety may be distinguished by the glumes both of which are always markedly ciliate with spreading hyaline hairs.

SOUTH WEST AFRICA.

Windhuk, 1906, *Bohr* 13 (B); Zwartbankberge (Kalkberge), IV. 1886, *Stapff* 9 [B (typus !), Z]; Aus, *Lewis* H. 19007 (N); Karubeam (Karabeam Mts. ?), VII. 1931, *Pillans* 6562 (BH).

CAPE PROVINCE.

Little Namaqualand distr.: Near Orange River mouth, VII. 1926, *Pillans* 5610 pro parte (BH, K); Clanwilliam distr.: Zoutrivier, VII. 1896, *Schlechter* 8138 (A, B, BH); Herbert distr.: Read's Drift, III. 1937, *Acock* 4321 (Mc).

TYPE SPECIMEN.

Stapff 9 is deposited in the Botanisches Museum, Berlin—Dahlem.

COMMON NAMES.

Common Groot Boesmangras. Pferdegras.

ECONOMIC NOTE.

Stapff states it to be a meagre foddergrass after rain.

7c. *A. ciliata* Desf. var. *tricholaena* Hack. in Bull. Herb. Boiss. 4 Append. III. 18 (1896); Stapf in Dyer, Fl. Cap. 7. 564 (1899); Dinter in Fedde, Rep. 15. 341 (1918); Henrard Crit. Rev. 1. 95 (1926); Henrard Monogr. 1. 42 (1929); Range in Fedde, Rep. 33. 8 (1933).

A. ciliata Desf. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915); Stapf in Dyer Fl. Cap. 7. 563 (1899); Range in Fedde, Rep. 33. 8 (1933) omnes pro parte non Desf.

This variety may be distinguished by the upper glume which is always markedly ciliate with spreading hyaline hairs. It is often found growing side by side with *A. ciliata* Desf. var. *capensis* Trin. et Rupr., the prevalent variety of this species in South Africa.

SOUTH WEST AFRICA.

Rössingberge, XI. 1938, *Volk* 23 (D); Ababis, IV. 1913, *Engler* 6134 (K); near Welwitsch, III. 1909, *Pearson* 4472 (BH, K); Windhuk, 1906, *Bohr* 13 (B); Haikamchab, I. 1907, *Galpin et Pearson* 7413 (BH, K, N, P); do., 7412 (V); between Achterfontein and Gelwater, XII. 1912, *Pearson* 9235 (K); Lüderitzbucht, I. 1907, *Range* 204 (B); Haalenberg, IV. 1929, *Dinter* 6302 (D, K, St); Angra Pequena, XI. 1884, *Schenck* 26 (N); do., 1894, *Schinz* 672 (BH, K, Z); near Tsirub, VII. 1885, *Schenck* 10, [V, (typus !), Z]; Klinghardtgebirge, VIII. 1913, *Schäfer* 529 (B); Tsirub, *Range* 1132 (B); Great Karasberg, I. 1913, *Pearson* 8496 (BH, BM, K); Sendlingsdrift, VII. 1912, *Range* 1564 (B); 25 Km north of Warmbad, II. 1909, *Pearson* 4293 (K).

CAPE PROVINCE.

Little Namaqualand distr.: Doornpoort, X. 1926, *Pillans* 5455 (BH); between Witbank and Orange River, X. 1926, *Pillans* 5131 (BH); Henkries, XI. 1897, *Schlechter*

10 pro parte (A). Prince Albert distr.: Swarts, V. 1920, *Pillans* 7059 (BrI). Prieska distr.: Prieska, IV. 1935, *Bryant* 607 (K, Mc). Gordonia distr.: Upington, *Pole Evans* 2175 (N). Mafeking distr.: Mafeking, IV. 1929, *Pole Evans* 2404 (K).

ORANGE FREE STATE.

Fauresmith distr.: Jagersfontein, IV. 1920, *Van der Walt* H. 19805 (N, W) et *van Breda* 31 (N).

TYPE SPECIMEN.

Schenck 10 is deposited in the Naturhistorisches Museum, Wien. A duplicate is deposited in the Botanisches Museum, Zürich.

COMMON NAMES.

Beesgras. Groot Twaagras. Tall Bushman Grass.

ECONOMIC NOTES.

This variety is considered to be a good foddergrass.

8. **A. Schaeferi** Mez in Fedde, Rep. 17. 152 (1921); Garabedian in Ann. S. Afr. Mus. 16. 404 (1925); Henrard Crit. Rev. 3. 535 (1928); Henrard Monogr. 1. 41 cum. ic. tab. 2 (1929); Theron in Fedde, Rep. 40. 11 (1936).

A. ciliata Desf. var. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915). *A. prodigiosa* Welw. sec. Haek. in Bull. Herb. Boiss. 4. Append. III. 19 (1896); Garabedian in Ann. S. Afr. Mus. 16. II. 404 (1925) pro parte; Dinter in Fedde, Rep. 15. 342 (1918); omnes non Welw.

Perennial, compactly caespitose, branched from the base. Innovations forming rather short and dense tufts. Culms up to 65 cm. high but usually much smaller, densely tufted, fascicled, erect or somewhat geniculately ascending from a robust almost suffrutescent rootstock, simple, 2-3-noded; internodes terete, smooth, slightly striate, swollen and often viscous just below the nodes, usually exserted; nodes perfectly smooth and glabrous. Lower leaf-sheaths short, densely lanate, striate, at length becoming glabrous and shiny, with well-developed hyaline margins; the upper shorter than or as long as the internodes, scabrous or shortly pubescent especially along the margins, striate; ligule a short hairy rim; auricles pubescent or very shortly ciliate, collar glabrous; blades striate, nearly glabrous beneath, densely shortly villous-pubescent on the upper surface, terminating in a pungent apex; those of innovations 1-2 cm., or up to 8 cm. long, recurved, firm subulate; those of the culm leaves up to 12 cm. long. Panicle exserted, or at first sheathed by the uppermost leaf, up to 26 cm. long, somewhat contracted but loose; axis terete or sub-compressed, striate or grooved upwards, almost smooth; branches filiform, erect or sub-erect, solitary or 2-3-nate, up to 8 cm. long exclusive of the awns, often branched from near the base; pedicels nearly glabrous, at times almost as long as the glumes, swollen towards the apex (clavate). Spikelets straw-coloured, usually flushed with purple near the base. Glumes about equal, boat-shaped, 3-nerved, glabrous or sometimes rigidly ciliate, very firm, both 8.5-12.5 mm. long. Lemma tubulous, glabrous, smooth, 9-10.5 mm. long, articulated 6-6.5 mm. from the base of the callus; callus long-hairy, acute from 1.75-2 mm. long; central awn 4-4.5 cm. long, naked in lower third, plumose above nearly to the tip, the latter short, naked and exserted, the feathery part subacute in outline; lateral awns naked, from 1.3-2.2 cm. long. Anthers 5.5-6.0 mm. long.

SOUTH WEST AFRICA.

Lower Swakop, IV. 1886, *Marloth* 1203 pro parte (N); Rössingberge, XI. 1938, *Volk* 19 (D) et 26 (D); Tsauchab, II. 1909, *Pearson* 4949 (K); Lüderitzbucht (Angra Pequena), I. 1907, *Galpin et Pearson* 7583 (K); do., XI. 1908, *Marloth* 4667 (K) et IV. 1909, *Marloth* 4742 pro parte (N); do., *Schinz* 664 (Z) et *Schinz* s.n. (V); do., *Peyer* s.n. (Z); do., IV. 1929, *Dinter* in Hb. Stell. 10790 (St); Pomona, VI. 1929, *Dinter* 6421 (B, BH, D, G, K, St); do., X. 1913, *Schäfer* 549 (B, N).

TYPE SPECIMEN.

Schäfer 549 is deposited in the Botanisches Museum, Berlin-Dahlem.

REMARKS.

This species superficially resembles *A. ciliata* Desf. var. *capensis* Trin. et Rupr. but can be readily recognised by the beardless nodes and the firm subulate leaf-blades.

8a. *A. Schaeferi* Mez var. *biseriata* Henrard Monogr. 1. 41 (1929); Henrard Crit. Rev. Suppl. 739 (1933).

In general appearance this variety resembles the species but may readily be distinguished by having shorter glumes, of which the upper (gluma II) is dorsally rigidly ciliate with long hyaline hairs.

SOUTH WEST AFRICA.

Welwitsch, I. 1907, *Galpin et Pearson* 7590 (N, K, S, V).

TYPE SPECIMEN.

The type specimen is deposited in the Naturhistorisches Museum, Wien.

REMARKS.

This variety is only known so far from the type gathering. It is apparently not at all a common plant.

9. *A. Dinteri* Hask. in Bull. Herb. Boiss. Ser. II. 1. 767 (1901); Dinter in Fedde, Rep. 15. 341 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925); Henrard Crit. Rev. 1. 143 (1926); Henrard Monogr. 1. 45 cum ic. tab. 4 (1929); Theron in Fedde, Rep. 40. 8 (1936).

A. coma-ardeae Mez in Fedde, Rep. 17. 152 (1921); Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925); Henrard Crit. Rev. 1. 106 (1926). *Aristida* sp. nearest *A. plumosa* Linn. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 235 (1915).

Densely caespitose erect glaucous *perennial* with intravaginal innovation shoots. *Culms* erect, often somewhat geniculate at the nodes, elegant, up to 40 cm. high, simple, 2-4-noded, the glabrous nodes equally distributed; internodes terete, scarcely striate, slightly thickened and grooved below the nodes and with depressed crateriform glands (which are more readily visible on old culms), smooth or scaberulous. *Sheaths* of the lower blades more or less reduced, 1-3 cm. long, rather thin, sometimes papery, densely striate, scabrous, pallid with broad hyaline margins; the upper tight, terete, scaberulous or scabrous especially along the margins, striate, at times slightly keeled, shorter than the internodes; *ligule* a ciliate rim; auricles densely ciliate and more or less bearded or the long hairs wanting; collar glabrous; *blades* erect or very laxly curled, linear not very rigid, setaceously convolute throughout, about 1 mm. wide when expanded, acuminate, about 12-15 cm. long, very scabrous on both surfaces and hirtellous on the upper surface, terminating in a setaceous point. *Panicle* erect, linear, rather narrow, but very lax and interrupted at the base, up to 20 cm. long including the spikelets and awns, just exerted or more or less sheathed by the uppermost leaf; axis terete and nearly smooth below, like the lower branches usually with depressed crateriform glands, upwards more or less angular and scabrous, striate; branches solitary or binate, scaberulous or nearly smooth, up to 10 mm. long, each bearing 1-3 erect adpressed spikelets on secondary branchlets (pedicels); pedicels very short, nearly sessile or up to 3 mm. long, always shorter than the glumes, scabrous, laterally grooved and slightly thickened. *Spikelets* strictly erect, whitish, glumes linear-lanceolate, about equal or slightly unequal, the lower 12-15 mm. long, 3-nerved or sub-5-nerved, acute, shortly awned, more or less hairy with soft spreading hairs, the upper glume 12-16 mm. long, narrower than the lower, 3- or 5-nerved, acute or with an inrolled subobtuse apex, less hairy than the lower glume. *Lemma* glabrous, linear-tubular, body of the lemma

from base of callus up to the branching-point of the awn 16–18 mm. long, the articulation 5–5.5 mm. from the base of the callus, the body gradually narrowed into a smooth distinctly twisted column about 4 mm. long; *callus* 1.5 mm. long, very acute; central awn spreading, from 5.5–7.0 cm. long, naked in the lower quarter part, densely plumose above, with a shortly excurrent naked tip, the feathery part acute to sub-acute in outline; lateral awns very delicate and thin, suberect, naked, from 14–18 mm. long. *Anthems* 5.5–6.0 mm. long.

SOUTH WEST AFRICA.

Haigamkhab, I. 1904, *Pearson* 503 (K); do., I. 1907, *Galpin et Pearson* 7434 (K, N) et 7436 (K, N, S); Khan River, III. 1900, *Dinter* 1485 (N, Z); Welwitsch, I. 1907, *Galpin et Pearson* 7416 (B, K, N, S) et 7419 (B, K, N, S); do., III. 1909, *Pearson* 4416 (BH, K) et 4418 (BH, K).

TYPE SPECIMEN.

Dinter 1485 is deposited in the Botanisches Museum, Zürich.

10. **A. prodigiosa** Welw. in Trans. Linn. Soc. 27. 80 cum tab. 25 (1869); Dur. et Schinz, Consp. 5. 807 (1894); Welw. Cat. Afr. Pl. 2. I. 205 (1899) pro parte; Henrard Crit. Rev. 2. 464 (1927); Henrard Monogr. 1. 44 cum ic. tab. 3 (1929).

Perennial, densely caespitose. *Culms* up to 50 cm. high, erect, simple, 2–4-noded; nodes constricted, glabrous; internodes terete and somewhat striate. *Leaf-sheaths* glaucous, glabrous or puberulous; *ligule* a ciliate rim, the auricles bearded, collar glabrous; *blades* up to 10 cm. long, curved or suberect, convolute, sulcate-striate, puberulous on both surfaces. *Panicle* erect, rather loose, linear-oblong in outline, up to 30 cm. long; axis compressed or angulate, glabrous; branches usually solitary, branched from near the base. *Spikelets* pale, yellow or greenish, purple at the base. *Glumes* subequal, keeled and acute, hairy all over, or glabrous at the margins and the apex, the hairs very soft and spreading; the lower 7 mm., the upper 8 mm. long. *Lemma* including callus and column up to branching-point of the awn 6–7 mm. long; *callus* very acute, densely hairy, about 2 mm. long; central awn naked at the base, up to 2 cm. long, scantily feathery at the tip; lateral awns naked, spreading, \pm 1 cm. long.

ANGOLA.

Cabo negro, IX. 1859, *Welwitsch* 2000a (K, N); Mossamedes, IV. 1909, *Pearson* 2276 (K, N).

TYPE SPECIMEN.

Welwitsch 2000a is deposited in the British Museum (Natural History), London.

REMARKS.

Although this species has so far not been found to occur in South West Africa, it is within the bounds of likelihood that it does actually grow in the extreme north-western coastal part of that region, which from a botanical point of view is as yet almost unexplored.

- 10a. **A. prodigiosa** Welw. var. **calva** Henrard Crit. Rev. 3. 467 (1928); Henrard Monogr. 1. 44 (1929);

A. prodigiosa Welw. Cat. Afr. Pl. 2.1. 205 (1899) pro parte.

The variety resembles the species very closely but may be easily distinguished by possessing glabrous glumes. The same general remarks with regard to the species apply to this variety.

ANGOLA.

Near Mossamedes, IV. 1909, *Pearson* 2247 (K); between Mossamedes and R. Coroca, IV. 1909, *Pearson* 2248 (K); along Mossamedes railway, IV. 1909, *Pearson* 2881 (K).

TYPE SPECIMEN.

Pearson 2881 is deposited in The Herbarium, Royal Bot. Gardens, Kew.

11. *A. capensis* Thunb. (sensu lato).

Perennial, compactly caespitose, glabrous. *Culms* simple, very rarely branched from the base, erect, up to 75 cm. high, wiry, smooth or scaberulous, 1-2-noded. *Leaf-sheaths* firm, glabrous, scaberulous or with a few scattered hairs, striate, shorter than the internodes; *ligule* a ciliate membrane; auricles glabrous or bearded; collar glabrous; *blades* filiform, convolute, up to 40 cm. long, at times overtopping the panicle, firm, at times flexuous, lower surface smooth, upper surface scaberulous to hispid. *Panicle* erect or more or less nodding, contracted, loose or effuse, somewhat secund, up to 30 cm. or more long; branches solitary, often branched from the base, branchlets ultimately capillary or filiform. Pedicels clavate. *Spikelets* erect or nodding, pale brown to purple. *Glumes* glabrous or hairy, unequal to subequal, linear-lanceolate; the lower 10-19 mm. long, the upper 11-20 mm. long. *Lemma* including the callus 5-8.5 mm. long, tubulous, dorsally smooth or pustulate; *callus* very acute, densely hairy, about 2.5 mm. long; *column* 1-14 mm. long, glabrous or hairy, usually twisted, shorter than or exceeding the glumes; awns unequal, the central 16-40 mm. long, the lateral 13-35 mm. long.

The above description has been drawn up so as to include the material enumerated under the following varieties. The salient points characterising each variety are enumerated separately under each of these varieties.

11a. *A. capensis* Thunb. var. *genuina* Henrard Crit. Rev. 1. 77 (1926); Henrard Monogr. 1. 50 cum ic. tab. 6 (1929).

A. capensis Thunb. Prodr. 19 (1794); Kunth Enum. 1. 95 (1833). *Chaetaria capensis* (Thunb.) Beauv. Agrostogr. 30 (1812); Roem. et Schult. Syst. Veg. 2. 395 (1817).

This variety may be distinguished by the glabrous column of the awns which is usually shorter than the glumes; at times however it exceeds the glumes by 1-2 mm. The feathers of the awns are white or canescent.

CAPE PROVINCE.

Malmesbury distr.: Darling, IX. 1905, *Bolus* 12910 (BH, N). Worcester distr.: Hex River Valley, X. 1881, *Tyson* 610 (A, K).

TYPE SPECIMEN.

Specimen β of *Thunberg* in Herb. Thunberg, Upsala, Sweden.

11b. *A. capensis* Thunb. var. *macropus* (Nees) Trin. et Rupr. Spec. Gram. Stip. 179 (1842); Walp. Ann. Bot. 3. 751 (1852); Dur. et Schinz, Consp. 5. 801 (1894); Stapf in Dyer, Fl. Cap. 7. 565 (1899); F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915); Henrard Crit. Rev. 1. 78 (1926); Henrard Monogr. 1. 50 cum ic. tab. 7 (1929); Theron in Fedde, Rep. 40. 16 (1936).

A. capensis Thunb. var. *fulviberbis* Trin. et Rupr. Spec. Gram. Stip. 179 (1842); Walp. Ann. Bot. 3. 751 (1852); Dur. et Schinz, Consp. 5. 801 (1894); Henrard Crit. Rev. 1. 78 (1926). *A. capensis* Thunb. var. *Zeyheri* Trin. et Rupr. sec. Stapf in Dyer, Fl. Cap. 7. 565 (1899) pro parte, excl. syn., non Trin. et Rupr. *Arthratherum capense* Nees var. *macropus* Nees, Fl. Afr. Austr. 176 (1841).

In this variety the column of the awns is glabrous and usually much exceeds the glumes. The feathers of the awns are bright yellow.

CAPE PROVINCE.

Little Namaqualand distr.: Kamiesberg, *Drège* 2544 (B); do., IX. 1911, *Pearson* 6499 (BH, K); Hondeklip Bay, X. 1924, *Pillans* 18266 (BH); between Goedemanskraal and Kaus, *Drège* (N); between Kuil and Modderfontein, *Drège* (G, S). Van Rhynsdorp distr.: near Ebenezer, *Drège* (B, K, P); Van Rhynsdorp, XI. 1923, *Rood* 789 (N); do., IX. 1900, *Diels* 527 (B). Clanwilliam distr.: Karreebergen, VII. 1896, *Schlechter* 8213 (A, B, BH, BM, G, K, N, P, T, V, W, Z); Haasdrift, IX. 1925, *Levy* 1278 (U); without exact locality, *Leipoldt* 336 (S); *Drège* (B, O); *Morris* BH. 21792 (BH); *Thunberg* (BM).

TYPE SPECIMEN.

Several sheets (leg. *Drège*, et *Ecklon*) together constituting the type are deposited in the Botanisches Museum, Berlin-Dahlem.

REMARKS.

Thunberg's gathering in the British Museum consists of a specimen in which the spikelets show the presence of a well-exserted naked column. Furthermore the awns are yellow-plumose. This sheet may thus not be considered a duplicate of the type of *A. capensis* var. *genuina* Henrard.

- 11c. *A. capensis* Thunb. var. *Dieterleniana* H. G. Schweickerdt in Kew Bull. 1939. p. 653.
a typo glumis subaequalibus extra pubescentibusque valde distincta.

The softly hairy glumes readily distinguish this variety from any of the others.

BASUTOLAND.

Leribe distr.: Maluti Mountains, *Staples* 146 (N). Quthing distr.: Leloaleng, I. 1916, *Dieterlen* 1205 (K, N, P).

ORANGE FREE STATE.

Ladybrand distr.: Westminster, III. 1934, *Celliers* 11 (K, N).

TYPE SPECIMEN.

Celliers 11 is deposited in the National Herbarium, Pretoria.

ECONOMIC NOTES.

This variety is reported to be unpalatable.

REMARKS.

This variety superficially bears great resemblance to *A. sericans* Hack. with which species it might easily be confused. The lemma of the latter however is not articulated and it is thus that one may readily distinguish between these two plants.

- 11d. *A. capensis* Thunb. var. *barbata* Stapf in Dyer, Fl. Cap. 7. 565 (1899); Henrard Crit. Rev. 1. 77 (1926); Henrard Monogr. 1. 50 cum ic. tab. 6 (1929); Theron in Fedde, Rep. 40. 16 (1936).

This variety is characterised by possessing a hairy column of the awns, furthermore by well developed leaves which usually overtop the panicle.

CAPE PROVINCE.

Uitenhage distr.: Near mouth of Zwartkops Rivier, *Zeyher* 4501 (B, K, N, P, V); between Kouga and Zwartkops Rivier, *Zeyher* 4501 (A, K, S, St, Z). Port Elizabeth distr.: Humewood, XI. 1907, *Rosenbrock* 671 (B); Schoenmakerskop, III. 1910, *Paterson* 989 (A); do., XI. 1907, *Rosenbrock* 627 (B); near Port Elizabeth, *Ecklon et Zeyher* 502 (BH, BM, K, O, S, V, Z); do., V. 1896, *Kemsley* 317 (A). Alexandria distr.: VIII. 1912, *Burt Davy* 14196 (N). Bathurst distr.: Port Alfred, *Hutton* 11 (A) et 11a (A, B, BH,

D, N, S, T, Z); do., X. 1916, *Tyson* BH 14877 (D, K, N, T); do., XI. 1922, *Britten* 2994 (A); do., VII. 1914, *Salisbury* 109 (WR, Z). East London distr.: East London, IV. 1903, *Galpin* 6557 (A, BH). Kentani distr.: Kei-mouth, V. 1893, *Flanagan* 1782 (BH, N, S); Gogwana River mouth, *Pegler* 265 (A, BH, N, Z). Without precise locality: *Pappe* s.n. (BM).

TYPE SPECIMEN.

The syn-types are all deposited in The Herbarium, Royal Bot. Gardens, Kew.

REMARKS.

This variety appears to have a well-defined geographic distribution, being restricted (or almost so) to the coastal areas of the Eastern Cape.

11e. *A. capensis* Thunb. var. *canescens* Trin. et Rupr. Spec. Gram. Stip. 178 (1842); Walp. Ann. Bot. 3. 751 (1852); Dur. et Schinz, Consp. 5. 801 (1894); Henrard Crit. Rev. 1. 77 (1926); Henrard Monogr. 1. 51 cum ic. tab. 6 (1929).

A. capensis Thunb. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915). *A. capensis* Thunb. var. *Zeyheri* (Nees) Walp. Ann. Bot. 3. 751 (1852); Dur. et Schinz, Consp. 5. 801 (1894); Stapf in Dyer, Fl. Cap. 7. 565 (1899); Henrard Crit. Rev. 1. 79 (1926); Henrard Monogr. 1. 51 cum ic. tab. 7 (1929). *A. Zeyheri* (Nees) Steud. Nomencl. Bot. ed. 2. 1. 132 (1841); Henrard Crit. Rev. 3. 686 (1928). *Arthratherum Zeyheri* Nees, Fl. Afr. Austr. 177 (1841).

This variety is distinguished by the hairy column up to 12 mm. long, glabrous glumes, and a panicle which is not overtopped by the leaves.

CAPE PROVINCE.

Clanwilliam distr.: Kardouw Krantz, XI. 1910, *Pearson* 5304 (BH, K); Malmesbury distr.: Moorreesburg, XI. 1885, *Bachmann* 870 (B, V, Z); Darling, VIII. 1883, *Bachmann* 597 (B, Z); Malmesbury, VIII. 1883, *Bachmann* 873 (B). Tulbagh distr.: Tulbagh, *Ecklon* (B); Tulbaghkloof, *Ecklon et Zeyher* 71 (77 ?) (A, N, V); Witzenberg, *Zeyher* (B). Worcester distr.: Worcester, *Rehmann* 2583 (K, Z) et 2669 (B, K, Z) et 2670 (B, V); Winterhoek, *Drège* (B); Worcester, *Zeyher* 77 (B, G); do., II. 1935, *Breda* 3 (N). Paarl distr.: Paarlberg, IV. 1830, *Drège* 8103 (B); Bain's Kloof, XI. 1896, *Schlechter* 9105 (A, B, BM, G, K, N, P, V, W, WR, Z). Hercules Pillar, VIII. 1931, *Levy's* 3175 (U). Cape distr.: Cape Town, *Burchell* 890 (K); do., VII. 1929, *Hitchcock* 24086 (W); do., XII. 1810, *Burchell* 272 (K); do., XII. 1881, *Tyson* 2392 (A); Rondebosch, II. 1816, *Bergius* 209 (B); Constantia, *Ecklon et Zeyher* 85 (G, N, V); do., XII. 1896, *Wolley Dod* 2235 (BM); Claremont, III. 1892, *Schlechter* 557 (B, P, Z); Wynberg, *Zeyher* 4502 (S) et *Zeyher* s.n. (A, S); Table Mountain, *Ecklon* 977 (K, O) et *Hitchcock* 24083 (K, N, W); Doornhoogte, *Ecklon* 72 (B, S); Camps Bay, III. 1936, *Adamson* 812 (U); Simons Bay, XII. 1852, *Milne* 255 (K) et *McGillivray* 391 (K); Eerste Rivier, XI. 1838, *Krauss* s.n. (V). Stellenbosch distr.: Somerset West, X. 1929, *Sandwith* 153 (K); Stellenbosch, *Duthie* 1646 (Sreg) et 1646a (Sreg). Caledon distr.: Houwhoek, II. 1896, *Schlechter* 7366 (A, B, BH, G, K, S, W, Z); Genadendal, XII. 1896, *Schlechter* 9843 (A, B, BH, G, K, N, P, T, W, Z); do., I. 1885, *Bolus* 7432 (B, K). Riverzondereinde, XI. 1828, *Drège* 8104 (B). Riversdale distr.: Riversdale, *Rust* 362 (B) et 363 (B) et 490 (B); do., II. 1893, *Schlechter* 2173 (B, Z); do., *Muir* 2133 (W). Uitenhage distr.: Uitenhage, *Bowie* s.n. (K); Port Elizabeth distr.: Humewood, V. 1914, *Patterson* 1095 (A). Without precise locality: *Bergius* (K); *Belanger* 153 (G); *Sieber* 129 (G); *Harvey* 298 (BM, K) et 324 (BM, K).

TYPE SPECIMEN.

Bergius s.n. is deposited in the Trinius Herbarium, Leningrad.

REMARKS.

The sheets enumerated under this variety by no means form a homogeneous unit. There is a great deal of variation in the length of the glumes and column of the awns.

There appears to be a gradual transition from *var. Zeyheri* to *var. canescens* and I have not been successful in distinguishing clearly between the two "varieties". For this reason a broader conception of the variety has been taken, and *var. Zeyheri* has been sunk in synonymy.

The specimens enumerated here are the more common form of the species and appear to be centred around the Cape Peninsula or in the coastal areas south-east from there.

12. **A. damarensis** Mez in Fedde, Rep. 17. 152 (1921); Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925); Henrard Crit. Rev. 1. 130 (1926); Henrard Monogr. 1. 53 cum ic. tab. 8 (1929); Theron in Fedde, Rep. 40. 14 (1936).

Perennial, laxly caespitose, robust, up to 1.2 metres high, branched from near the base. Innovations intravaginal. *Culms* simple, erect, 2 mm. in diam. at the base, 3-4-noded; nodes equally distributed, slightly constricted; internodes terete, glabrous and smooth, minutely striate, exserted. Lower *leaf-sheaths* distichous and flabellate, gaping, yellow, striate, glabrous, rounded on the back, up to 6 cm. long, margins hyaline sometimes hairy; the upper leaf-sheaths much longer, up to 15 cm. long, tight, terete, striate, glabrous, minutely pubescent along the margins, scaberulous between the nerves, shorter than the internodes; *ligule* a minutely but densely ciliolate rim; auricles thickened, pubescent, those of the innovations long-bearded; *blades* of the culm-leaves very firm, almost junciform, the lower fairly short (\pm 8 cm. long), the upper up to 40 cm. long, narrowly convolute, glaucous, glabrous, striate, scaberulous along the furrows beneath, upper surface scabrous, up to 3 mm. wide, narrowed into a pungent tip; blades of the innovations shorter, the margins more conspicuously pubescent above. *Panicle* sheathed at the base by the uppermost leaf, about 45 cm. long, rather narrow, contracted but not very dense or spike-like; axis subterete, deeply striate (grooved), glabrous, angular upwards; branches solitary to 3-nate, the longer ones 6-8 cm., 10-12-flowered, naked at the base, erect and adpressed, scaberulous; pedicels subclavate, shorter or slightly longer than the glumes. *Spikelets* erect, pallid or yellow. *Glumes* with an inverse position, almost glabrous, scabrous or minutely pilose towards the apex and margins; the lower 3-5-nerved, abruptly narrowed into the short mucro, 12-17 mm. long; the upper 3-nerved, the keel scabrous upwards, 12-14 mm. long, tip subacute or truncate with a short mucro. *Lemma* glabrous, including the callus about 5-6.5 mm. long; *callus* rather blunt, 1 mm. long, hairy; column of awns 5-7 mm. long; central awn densely long-plumose, obtuse in outline, without an exserted tip, 15-22 mm. long; lateral awns plumose, 9-15 mm. long. *Anthers* 5-6.5 mm. long.

SOUTH WEST AFRICA.

Khan-Schlucht, II. 1936, Boss TM. 35640 et NH. 21076 (K, N, T); Haigamkhab, I. 1907, Galpin et Pearson 7577 (B, K, N, S); about 30 miles from Swakopmund, XII. 1929, Moss 17837 (N, WR).

TYPE SPECIMEN.

Galpin et Pearson 7577 is deposited in the Botanisches Museum, Berlin-Dahlem.

13. **A. sabulicola** Pilger in Engl. Bot. Jahrb. 40. 81 (1908); F. Bolus in Ann. S. Afr. Mus. 9. IV. 235 (1915); Dinter in Fedde, Rep. 15. 342 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 404 (1925); Henrard Crit. Rev. 3. 526 (1928); Henrard Monogr. 1. 53 cum. ic. tab. 11 (1929); Range in Fedde, Rep. 33. 9 (1933); Theron in Fedde, Rep. 40. 17 (1936).

Perennial, very robust, tall and stiff, up to 2 metres high, from a much-branched vigorous rhizome. Subterranean branches developing in all directions, with scale-like leaves and fibrous roots at the nodes. *Culms* rigid, strictly erect, glabrous, fasciculately branched, with the branches erect; internodes included or exserted, glabrous or somewhat viscose just below or above the nodes (at the mouth of the leaf-sheaths?), sometimes with minute depressed cateriform glands?; nodes glabrous. *Leaf-sheaths* long, longer or shorter than

the internodes, tight, striate, glabrous, often with minute gland-like depressions between the nerves, the lower merely short scales; *ligule* a shortly ciliate rim; auricles pubescent or almost glabrous; collar glabrous; *blades* very rigid, thick, stiffly erect, 25–40 cm. long, often much longer, involute or complicate, junciform, very acute and pungent, terete, smooth on lower surface, hirtellous or scabrous on the upper surface, many-nerved, the margins not thickened (when flattened out) up to 5 mm. broad at the base. *Panicle* shorter than the blades, narrow, densely spiciform, 10–30 cm. long, about 1–2 cm. broad at the base; branches short, divided and spikelet-bearing nearly from the base; the lower branches up to 5 cm. long, adpressed and more or less naked at the base. *Spikelets* densely congested, yellowish. *Glumes* quite smooth, slightly unequal, subobtusate or acute; the lower 3-nerved, 8–11 mm. long; the upper 1-nerved, 9–12 mm. long. *Lemna* punctulate or smooth, including the callus 4.75–6 mm. long; *callus* pungent, very acute, curved, about 1.5 mm. long, densely bearded, especially above; column very short, 1–1.5 mm. long. Awns subequal, densely plumose to the tips, 5.5–10 mm. long, acutish in outline, the central usually somewhat longer than the lateral; branching point of awns produced into 2 thin, hairy appendages, bearing a pencil of hairs at the subobtusate tips. *Caryopsis* 4 mm. long, 1 mm. broad, spindle-shaped, anteriorly compressed; scutellum about one-third as long as the fruit.

SOUTH WEST AFRICA.

Rotkop, II. 1929, *Dinter* 6009 (B, BH, D, G, K, St): north of Rotkuppe Station, II. 1909, *Pearson* 4185 (BH, K); Haris, I. 1907, *Range* 174 (B) et 179 (B); Kuisebthal, IV. 1886, *Stapff* 10 et 11 (B); in the Kuiseb River at Walfishbay, VII. 1888, *Gürich* 122 (B); Rooibank near Walfishbay, *Schultze* 379 (B); Schwarzbank along Kuiseb River, VII. 1888, *Gürich* 119 (B); Anichab, II. 1907, *Range* 209 (B, K); Anichab, III. 1907, *Peyer* 248 (*Schäfer* 248) (B, N, V); Lüderitzbucht, *Peyer* s.n. (Z); Gun-Anichab, *Peyer* s.n. (Z); Lüderitzbucht, IV. 1907, *Marloth* 4741 (K); do., IV. 1907, *Range* 209a (B, N); Garub, *Schäfer* 1269 (B).

TYPE SPECIMEN.

The syn-types are deposited in the Botanisches Museum, Berlin-Dahlem. They are *Schultze* 379, *Gürich* 119 et 122.

ECONOMIC NOTES.

Used by the natives for plaiting mats. These are used to cover their huts. The mats easily imbibe moisture and thus become impervious to rain.

14. *A. Marlothii* Hack. in Engl. Bot. Jahrb. **11**. 400 (1889); Dur. et Schinz, Consp. **5**. 804 (1894); Hack. in Bull. Herb. Boiss. **4** Append. III. 19 (1896); Stapf in Dyer, Fl. Cap. **7**. 567 (1899); Henrard Crit. Rev. **2**. 334 (1927); Henrard Monogr. **1**. 82 cum ic. tab. 21 (1929); Theron in Fedde, Rep. **40**. 19 (1936).

A. lutescens Steud. var. *Marlothii* Stapf in Dyer, Fl. Cap. **7**. 567 (1899); Dinter in Fedde, Rep. **15**. 342 (1918); Garabedian in Ann. S. Afr. Mus. **16**. II. 403 (1925). *A. lutescens* Steud. sec. Hack. in Bull. Herb. Boiss. **4**. Append. III. 18 (1896) pro parte; Dinter in Fedde, Rep. **15**. 342 (1918) non Steud. *A. lutescens* Trin. et Rupr. sec. Engler in Engl. Bot. Jahrb. **19**. 129 (1894). *A. namaquensis* (Nees) Trin. et Rupr. sec. Garabedian in Ann. S. Afr. Mus. **16**. II. 403 (1925); Range in Fedde, Rep. **33**. 8 (1933) pro parte, non (Nees) Trin. et Rupr.

Perennial, strictly erect; almost suffrutescent, with a thick rhizome. Innovations intravaginal, densely sheathed at the base by firm, reduced mucronate (blades!) scales. Culms erect (or somewhat ascending), simple, terete, glabrous, many-noded; internodes all included, or usually the upper 1 or 2 exserted, grooved or somewhat angular just below the nodes, glabrous; nodes bearded with conspicuous white hairs. Leaves congested at the base of the culms, glaucous; sheaths tight, terete, the lower longer and the upper usually shorter than the internodes, somewhat striate, glabrous; *ligule* a short ciliate rim; auricles glabrous or minutely ciliate; collar glabrous; *blades* linear, acuminate, pungent,

3-7.5 cm. long, very rigid, spreading, often somewhat recurved, convolute and junciform, 1-5 mm. in diameter, glabrous and somewhat grooved beneath, puberulous on the upper surface, prominently equally 5-7-nerved. *Panicle* effuse, pyramidal, up to 25 cm. long, very lax and open; axis glabrous, angular and somewhat grooved upwards; branches filiform, glabrous, with distinct pencils of hairs in their axils, lower branches semi-whorled or subfascicled, often solitary, the longer branchlet in each branch 5-6-flowered, the others 2-3-flowered; pedicels glabrous, filiform, slightly thickened upwards, often flexuous or curved, as long as or longer than the glumes. *Spikelets* linear-lanceolate, yellowish or greenish. *Glumes* lanceolate, acuminate, shortly awned, glabrous, 3-nerved; the lower 10-12 mm. long, slightly scaberulous or hirtellous on the keel above; the upper from 12-14 mm. long, scaberulous upwards on the keel. *Lemma* linear-oblong, including the callus 6-8 mm. long; callus oblique, densely hairy, very acute, 2 mm. long; awns somewhat unequal, all plumose; column very short, about 0.5-1.5 mm. long, not twisted; central awn up to 20 mm. long, feathery to the very tip, obtuse in outline; lateral awns apparently naked, but seen under a strong lens distinctly plumose, or conspicuously so, from 12-15 mm. long. *Anthers* 4-5-5.5 mm. long.

SOUTH WEST AFRICA.

Near Haris, I. 1907, *Range* 181 (B); Sandfontein near Walfishbay, IV. 1886, *Marloth* 1176 (A, B, BH, K, S); Walfishbay, IV. 1905, *Schultze* 380 (B); Scheppmannsdorf, *Stapff* 13 (B); Schwarzbank along Kuiseb River, VII. 1888, *Cürich* 117 (B); Tsaukaib, XI. 1909, *Marloth* 4665 (K, N); Aus-Namib, X. 1910, *Marloth* 5002 (N); 50 Km. west of Kuibis, I. 1913, *Range* 1830 (B); Garub, III. 1908, *Kolonialamt* s.n. (B).

TYPE SPECIMEN.

Marloth 1176 is deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAMES.

Goa-gras. Stechgras. Löwengras.

ECONOMIC NOTES.

A good but scanty foddergrass as long as the shoots are green.

15. *A. lutescens* (Nees) Trin. et Rupr. Spec. Gram. Stip. 173 (1842); Walp. Ann. Bot. 3. 750 (1852); Steud. Syn. Pl. Glum. 1. 145 (1854); Dur. et Schinz, consp. 5. 804 (1894); Hack. in Bull. Herb. Boiss. 4 Append. III. 18 (1896) pro parte; Stapf in Dyer, Fl. Cap. 7. 567 (1899) excl. syn. pro parte; Garabedian in Ann. S. Afr. Mus. 16. II. 403 (1925); Henrard Crit. Rev. 2. 316 (1927); Henrard Monogr. 1. 84 cum ic. tab. 22 (1929); Range in Fedde, Rep. 33. 9 (1933); Theron in Fedde, Rep. 40. 18 (1936).

Arthratherum lutescens Nees, Fl. Afr. Austr. 179 (1841); Presl, Bot. Bemerk. 121 (1844).

Perennial, with a creeping rhizome, covered like the base of the culms and the innovation-buds with scale-like pallid sheaths, usually much-branched. *Culms* erect, slender, fascicled, terete, glabrous and smooth, many-noded, up to 70 cm. long; internodes glabrous, terete, the upper usually exserted; nodes glabrous. Lowermost *leaf-sheaths* pallid, striate, glabrous or more or less hairy, with much-reduced blades; leaf-sheaths of the culms tight, glabrous, somewhat striate, the upper usually somewhat shorter than the internodes; *ligule* a ciliate short rim; auricles minutely pubescent; collar glabrous; *blades* subulate, convolute and pungent, up to 12 cm. long but usually shorter, rigid, curved, spreading, glabrous and smooth beneath, puberulous and hirtellous on the upper surface. *Panicle* ovate or pyramidal, very lax and open, in depauperated specimens somewhat contracted, erect, up to 25 cm. long; rhachis smooth; branches 2-3-nate or solitary and divided nearly from the base, remotely and sparsely branched, filiform, flexuous and smooth, the axils swollen and glabrous, lower branches up to 8 cm. long, few-flowered. Pedicels smooth, curved or flexuous; rather

long, those of the lateral spikelets shorter or more rarely as long as the glumes. *Spikelets* scattered, often nodding, light green or yellowish. *Glumes* lanceolate, unequal, gradually narrowed, not awned, with an obtuse, truncate or toothed apex, glabrous, 3-nerved, the lateral nerves not or scarcely anastomosing; the lower 9–11 mm. long; the upper 11.5–14 mm. long. *Lemma* subcylindric, rounded at the base, suddenly narrowed into the callus, including the latter 6–7 mm. long; *callus* 2–2.5 mm. long, shortly hairy, very acute; column of awns 2–5 mm. long, twisted; central awn up to 2.7 cm. long, scantily hairy at the base, densely plumose to the very tip, the feathery part acutish in outline; lateral awns 9–23 mm. long, very fine, apparently glabrous but scantily and adpressedly ciliate.

SOUTH WEST AFRICA.

Omuramba and Omatoke, VI. 1911, *Seiner* 700 (50) (B); Scheppmannsdorf, 1885, *Stapff* s.n. (Z); Rheinpfalz, VI. 1929, *Dinter* 6413 (B, BH, D, K, N, S, St); Klinghardtgebirge, IX. 1922, *Dinter* 3944 (BH, N); do., VIII. 1913, *Schäfer* 530 (B); Obib, VIII. 1908, *Range* 589 (B).

CAPE PROVINCE.

Little Namaqualand distr.: At the mouth of the Orange River, X. 1830, *Drège* (727) (B, BM, G, K, N, O, P, S, V); Groot Derm, X. 1926, *Pillans* 5274 (BH, K); between Arris Drift and Anisfontein, X. 1926, *Pillans* 5245 (BH, N); Zilverfontein, *Drège* 2040 (B).

TYPE SPECIMEN.

Drège 2040 is deposited in the Botanisches Museum, Berlin-Dahlem.

16. **A. subacaulis** (Nees) Steud. Nomencl. Bot. ed. 2. **1.** 132 (1842); Trin. et Rupr. Spec. Gram. Stip. 171 (1842); Walp. Ann. Bot. **3.** 750 (1852); Steud. Syn. Pl. Glum. **1.** 144 (1854); Dur. et Schinz, Consp. **5.** 809 (1894); Hack. in Bull. Herb. Boiss. **4.** Append. III. 19 (1896) pro parte; Stapf in Dyer, Fl. Cap. **7.** 568 (1899) pro parte; Dinter in Fedde, Rep. **15.** 343 (1918) pro parte; Garabedian in Ann. S. Afr. Mus. **16.** II. 405 (1925) pro parte; Henrard Crit. Rev. **3.** 601 (1928); Henrard Monogr. **1.** 71 cum ic. tab. 18 (1929); Range in Fedde, Rep. **33.** 10 (1933); Theron in Fedde, Rep. **40.** 29 (1936).

Atriratherum subacaulis Nees, Fl. Afr. Austr. 180 (1841).

Annual, in small compact tufts, including the culms and awns up to 10.0 cm. high, but usually very much smaller. *Culms* minutely hairy, sheathed all along. *Sheaths* loose, the lowermost bladeless and resembling striate membranous scales, the upper markedly striate, scabrid above and with broad membranous margins; *ligule* a small ciliolate rim, auricles bearded, collar smooth; *blades* fairly short, setaceously convolute, up to 3 cm. long, about 1 mm. wide when expanded, strongly striate, asperulous on both surfaces, acute, sub-rigid, more or less curved. *Panicle* few-flowered, much reduced, contracted, almost hidden by the radical leaves, usually somewhat sheathed by the uppermost leaf and sub-exserted; *rhachis* and branches hispidulous; *pedicels* short, hispidulous or more or less pilose at the clavate tip. *Spikelets* whitish, erect. *Glumes* linear-lanceolate, acuminate, both 3-nerved, membranous, lateral nerves about half the length of the midrib, the latter slightly scabrous towards the apex; the lower 10–13 mm. long; the upper 8–10 mm. long. *Lemma* including the callus 3–4 mm. long, lanceolate-ovate, smooth and glabrous; *callus* very acute, about \pm 1 mm. long, long-hairy; length of column of awn extremely variable (even in one and the same plant), 1–13 mm. long (spikelets near the base of the panicle have shorter columns than those situated nearer the apex), twisted; central awn plumose, slightly hairy at the base, scaberulous in lower part, plumose above the middle to the very tip, up to 4.3 cm. long; lateral awns very fine, up to 1.8 cm. long. *Anthers* 4 mm. long.

SOUTH WEST AFRICA.

Spitzkopje, I. 1937, *Boss* TM. 36368 (N, T); Richthofen, IV. 1913, *Engler* 6072 (B, K); Swakopmund, V. 1937, *Boss* TM. 36316 et 36317 (T); Arandis, I. 1937, *Boss* TM. 36395

pro parte (N, T); Welwitsch, I. 1907, *Galpin et Pearson* 7466 (BH, K, N, P, S); Walfishbay, *Nachtigal* 6 (B); Haalenberg, IV. 1929, *Dinter* 6301 (B, BH, D, G, K, N, S, St); Lüderitzbucht (Angra Pequena), X. 1884, *Schinz* 666 pro parte (Z); do. *Schinz* s.n. (V); do., XI. 1884, *Schenck* 32 (N); Klinghardtgebirge, VIII. 1913, *Schäfer* 528 (B); Namib, *Range* 1131 (B, W).

CAPE PROVINCE.

Little Namaqualand distr.: Near the mouth of the Orange River, X. 1926, *Pillans* 5607 (BH, K, N); Verleptpram, IX. 1830, *Drège* (2541) (B, BM, G, K, N, O, P, S, V); Richtersveld, near Arris Drift, IX. 1925, *Marloth* 12394 (N, St) et VIII. 1925, *Marloth* 12394a (N); do., VII. 1925, *Meyer* in Hb. Stell. 9056 (St).

TYPE SPECIMEN.

Drège from Verleptpram is deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAME.

Muis-gras.

REMARKS.

The length of the column of the awn varies considerably, even in one and the same gathering. In *Dinter* 4104 it may be 4–13 mm., in *Dinter* 6301 from 5–10·5 mm., whereas in *Schenck* 32 it is only about 1 mm. long. In this species the length of the column is thus hardly of any taxonomic value.

17. **A. Hermannii** Mez in Fedde, Rep. **17**. 153 (1921); Garabedian in Ann. S. Afr. Mus **16**. II. 402 (1925); Henrard Crit. Rev. **2**. 22b (1927); Henrard Monogr. **1**. 73 cum ic tab. 18 (1929); Theron in Fedde, Rep. **40**. 31 (1936).

A. Hermannii Mez var. *hereroensis* Henrard Crit. Rev. **2**. 22b (1927); Henrard Monogr. **1**. 73 (1929).

A. subacaulis (Nees) Steud. sec. Stapf in Dyer, Fl. Cap. **7**. 568 (1899); Hack. in Bull. Herb. Boiss.

4. Append. III. 19 (1896); Dinter in Fedde, Rep. **15**. 343 (1918); omnes pro parte, non (Nees) Steud.

Annual, laxly caespitose, up to 15 cm. high including the awns. Sterile innovations absent. *Culms* geniculately-ascending, 2–4-noded. Internodes subterete or angular, striate, densely but minutely pubescent, exserted, the upper included. Lower *leaf-sheaths* densely aggregated, loose, white and papery, about 1 cm. long, keeled, densely striate and hirtellous, especially on the nerves, margins shortly pilose or ciliate, broad and hyaline; upper leaf-sheaths much longer, up to 5 cm. long, very broad, inflated, loosely enveloping the internodes or part of the inflorescence, margins less ciliate, hyaline, striate and minutely scaberulous; *ligule* a ciliate rim; auricles bearded; collar constricted; *blades* of all the leaves much reduced; the lower spirally curved and twisted, scabrous-hirtellous on both surfaces, 1–2 cm. long, about 1 mm. wide at the base or somewhat broader, apex subobtusate; the upper curved or straight and scarcely 1·5 cm. long, convolute, much narrower than the sheaths. *Panicle* scarcely exserted, partly sheathed by the uppermost sheath, ovate-oblong, dense, up to 8 cm. long including the awns; axis striate, subterete, scabrous-hirtellous; branches short, solitary, divided nearly from the base; branchlets fascicled, short; pedicels scabrous, axils pubescent, thickened towards the apex, shorter than the glumes. *Spikelets* pallid. *Glumes* narrowly lanceolate, acute, shortly awned 3-nerved, almost hyaline; the lower 9–11·5 mm. long, densely but minutely scaberulous on the outer surface; the upper 8–10 mm. long, glabrous at the base but minutely scaberulous towards the apex. *Lemma* punctulate-scabrous under a strong lens, including the callus 3·5–4 mm. long, linear-tubulous with a somewhat oblique articulation, apex minutely bi-lobed; *callus* acute, densely hairy, about 1–1·25 mm. long; column of awns very scabrous, twisted, pubescent at and below the branching point, extremely variable in length, from 1–10·5 mm. long even on the same specimens; central awn scabrous in the lower third, plumose above, the tip sometimes slightly exserted but more usually not acute to subobtusate in outline, 2–4·0 cm. long; lateral awns naked, very fine, 1–1·5 cm. long. *Anthers* ± 2 mm. long.

ANGOLA.

Between Mossamedes and R. Coroca, IV. 1909, *Pearson* 2265 (K, N, P, Z); Mossamedes, behind the town, IV. 1909, *Pearson* 2286 (K, N).

SOUTH WEST AFRICA.

Arandis, I. 1937, *Boss* TM. 36395 pro parte (T); between Swakopmund and Walfishbay, *Boss* TM. 36439 (N, T); Lüderitzbucht (Angra Pequena), X. 1884, *Schinz* 665 et 666 (Z); do., XI. 1884, *Schenck* 32 (N, Z); do., *Schenck* s.n. (V); do., XI. 1889, *Hermann* 42 (B); Pomona, V. 1929, *Dinter* 6344 (BH, N) et *Dinter* 6396 (B, BH, D, G, K, N, S, St); Hereroland, *Nels* s.n. (V).

the upper CIMEN.

long or slightly 42 is deposited in the Botanisches Museum, Berlin-Dahlem.
of awns up

DEMENTE

In this species the column of the awn is extremely variable as to its length. *Dinter* 6344 has spikelets in which the column is only 1 mm. long, whereas in *Pearson* 2265 the column varies from 3–10.5 mm. in length.

18. *A. geminifolia* (Nees) Trin. et Rupr. Spec. Gram. Stip. 169 (1842); Walp. Ann. Bot. 3. 749 (1852); Steud. Syn. Pl. Glum. 1. 144 (1854) [sphalm. geminiflora]; Dur. et Schinz, Consp. 5. 803 (1894); Stapf in Dyer, Fl. Cap. 7. 570 (1899); *Dinter* in Fedde, Rep. 15. 341 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 402 (1925) pro parte; Henrard Crit. Rev. 1. 194 (1926); Henrard Monogr. 1. 66 cum ic. tab. 16 (1929); Range in Fedde, Rep. 33. 8 (1933); Theron in Fedde, Rep. 40. 26 (1936) [sphalm. geminiflora].

Stipagrostis geminifolia Nees, Fl. Afr. Austr. 173 (1841); Presl, Bot. Bemerk. 121 (1844).

Perennial, densely caespitose, branched from the base, almost suffrutescent, up to 25 cm. high including the awns. *Culms* erect or ascending, slender, glabrous or hairy below the panicle, rather few-noded, simple, terete, striate; internodes very unequal, markedly striate; the lower short, sheathed, included; the following long exserted, up to 12 cm. long; the next short to very short, 5–20 mm. long, enclosed or exserted; the last slightly longer or equalling the former in length and usually shortly exserted, often geniculate. Innovations intravaginal with a similar alternation of short and long internodes; nodes bearded or becoming glabrous with age. *Leaves* crowded near the base, the uppermost again approximate, sometimes subopposite; sheaths short, striate with much reduced leaf-blades, the lower tight and parched, glabrous, with woolly or ciliate margins, the upper less tight and almost spathe-like, sometimes slightly hirsute with tubercle-based hairs; *ligule* a ciliolate rim; auricles bearded; collar glabrous; blades short, almost rudimentary, subulate, involute, subpungent, 3–10 mm. long, rarely longer, very rigid and divaricately spreading, striate and glabrous below, pubescent on the upper surface. *Panicle* sub-erect or somewhat nodding, very short, spike-like and often secund, including the awns up to 4 cm. long and 2.5 cm. broad; rhachis glabrous or hairy, branched from near the base; branches hairy; pedicels hairy, very short, almost sessile. *Spikelets* crowded and congested yellowish-brown and tinged with purple. *Glumes* unequal, linear-lanceolate, acuminate, long-awned, the tips of both convolute and slightly bifid, but the setulae inconspicuous; the lower 8–12 mm. long, hirsute all over, manifestly 3-nerved; the upper 10–12 mm. long, narrower, more or less glabrous at the base, hirsute above, 1–3-nerved. *Lemma* including the callus 4–6 mm. long, linear-oblong, smooth, pale or purplish, minutely bilobed; *callus* about 1.5 mm. long, very acute, densely hairy; column of awn 1–2 mm. long, slightly twisted; central awn spreading, 18–30 mm. long, plumose, lower part shortly hairy, upper part long feathery to the very tip, obtuse in outline; lateral awns naked, up to 15 mm. long. *Pale* emarginate, 2-nerved, 1 mm. long. *Anthers* 3–4 mm. long.

SOUTH WEST AFRICA.

Namib, Kuos, IX. 1913, *Range* 1874 (B); Haalenberg, X. 1922, *Dinter* 4099 (B, BH, N, Z); Lüderitzbucht, VII. 1922, *Dinter* 3829 (BH, N); Pomona, V. 1927, *Dinter* 6365 (B, BH, D, G, K, N, S, St); Zwischen Prinzenbucht und Bogenfels, IX. 1912, *Schäfer* 587 (B); near Bogenfels, VIII. 1911, *Marloth* 12987 (N); Buntfeldschuh, VII. 1913, *Schäfer* 524 (B); Obib, VIII. 1908, *Range* 586 (B); without precise locality, *Kuhn* s.n. (B).

CAPE PROVINCE.

Little Namaqualand distr.: At the mouth of the Orange River, *Drège* (B, BM, G, N, O, S); between Kaus, Natvoet and Doornpoort, *Drège* (B, P, V); near Orange River mouth, X. 1926, *Pillans* 5606 (BH, K, N); Richtersveld, IX. 1925, *Marloth* 12415 (N, St).

TYPE SPECIMEN.

Drège 2561 is deposited in the Botanisches Museum, Berlin-Dahlem. lin-Dahlem.

19. *A. fastigiata* Hack. *apud* Schinz in Bull. Herb. Boiss. Ser. II. 1. 768 (1901) in Fedde, Rep. 15. 341 (1918); Henrard Crit. Rev. 1. 175 (1926); Henrard TYPE SPECIMEN
1. 67 cum ic. tab. 15 (1929); Theron in Fedde, Rep. 40. 27 (1936).

A. geminifolia (Nees) Trin. et Rupr. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915); Garabedian in Ann. S. Afr. Mus. 16. II. 402 (1925) omnes pro parte, non (Nees) Trin. et Rupr.

Perennial, fairly densely caespitose, with a much-branched thick rhizome. *Culms* arising in fascicles at intervals from the rhizome, elegant, erect or somewhat geniculately ascending, 4-5-noded, up to 35 cm. high, sheathed all along, simple, terete; internodes more or less equal in length, exerted, only slightly striate, laterally sulcate, somewhat scaberulous; nodes annular, densely bearded with long spreading white hairs. *Leaf-sheaths* (except the lowermost) much shorter than the internodes, terete, tight, striate, only slightly scabrous, with ciliate margins; *ligule* a shortly ciliate rim; auricles densely divaricately bearded; collar glabrous; blades linear-lanceolate, acute, gradually narrowed into a setaceous point, more or less curved, flat at the base and 2-3 mm. wide, convolute upwards, up to 12 cm. long, but usually much shorter, many-nerved, margins not thickened, scaberulous beneath, pubescent or densely hirtellous on the upper surface. *Panicle* well-exserted, more rarely sheathed by the uppermost leaf, slightly nodding or erect, more or less obovate, dense, few to many-flowered, subsecund and subfastigiate, including the awns up to 8 cm. long; axis striate, scaberulous; branches scabrous, solitary, scarcely 5 mm. long, bearded in the axils; pedicels very short, hairy. *Spikelets* congested, greenish-white, often darker (brown) at the base. *Glumes* unequal, 3-nerved, hairy all over, the tips more or less glabrescent; the lower 10-14 mm. long, acute; the upper 14-18 mm. long, acuminate, with a minutely bifid apex and inrolled tips. *Lemma* oblong, smooth, bilobed at the apex, 5-5.5 mm. long including the callus; *callus* 1.5-2 mm. long, densely hairy, very acute; central awn 3-3.5 cm. long, feathery all over, obtuse in outline; lateral awns naked, 1-2 cm. long. *Anthems* 5 mm. long.

SOUTH WEST AFRICA.

Namib, VI. 1936, *Boss* TM. 36148 (K, N, T); 12 km. west of Sandverhaar, II. 1909, *Pearson* 4600 (A, BH, BM, D, K, N, S); Inachab, XI. 1898, *Dinter* 1102 (B, N, V, W, Z); between Kalkfontein and Nakob, I. 1916, *Pearson* 9709 (BH, K, S).

TYPE SPECIMEN.

Dinter 1102 is deposited in the Botanisches Museum, Zürich.

REMARKS.

This species is closely related to *A. geminifolia* but is characterised by having the internodes more uniform in length and well-developed leaf-blades. In *A. geminifolia* the upper two leaf-sheaths are approximate and leaf-blades are almost totally wanting; the spikelets are more robust and larger than in *A. fastigiata*.

20. **A. hirtigluma** Steud. ex Trin. et Rupr. Spec. Gram. Stip. 171 (1842); Steud. Nomencl. Bot. ed. 2. 131 (1841) nomen tantum; Hack. in Bull. Herb. Boiss. 4. Append. III. 18 (1896); Henrard Monogr. 1. 68 cum ic. tab. 15 (1929).

Arthratherum ciliatum Nees, Fl. Afr. Austr. 182 (1841) excl. syn.

Delicate annual, caespitose. Culms up to 40 cm. long, 2-4-noded, glabrous; internodes terete and striate, usually scaberulous; nodes glabrous. Leaf-sheaths shorter than the internodes, striate, scabrous, somewhat compressed; ligule shortly ciliate; auricles long-bearded; collar glabrous; blades 6-15 cm. long, setaceous, convolute, scaberulous on the lower surface, upper surface somewhat hairy, especially towards the ligule. Spikelets pale, hirtellous. Glumes unequal to subequal; the lower up to 6 mm. long, ciliate dorsally; the upper up to 10 mm. long, dorsally ciliate. Lemma including the callus up to 4 mm. long or slightly longer, tuberculate; callus long and sharp, somewhat oblique; column of awns up to 10 mm. long, hairy or glabrous; central awn very long (up to 5-7 cm.), feathery with a naked excurrent tip; lateral awns about 1-1.5 cm. long.

ANGOLA.

Loanda, Gossweiler 4943 (K, N).

SOUTH WEST AFRICA.

Rehoboth, VI. 1889, Fleck 802 (V, Z). Bethanie, IV. 1933, Van Son TM. 31827 (T); Usakos, XII. 1938, Volk 150 (D).

TYPE SPECIMEN.

Schimper 165 is deposited in the Botanisches Museum, Berlin-Dahlem.

21. **A. gracilior** Pilger in Engl. Bot. Jahrb. 40. 80 (1907); Dinter in Fedde, Rep. 15. 341 (1918); Henrard Crit. Rev. 1. 208 (1926); Henrard Monogr. 1. 69 cum ic. tab. 15 (1929).

A. hirtigluma Steud. var. *patula* Hack. in Denkschr. Kais. Akad. Wiss. Wien, Math.—Naturw. Kl. 78. 401 (1906). *A. hochstetteriana* Beck ex. Hack. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte, non Beck. *A. uniplumis* Licht. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte, non Licht.

Perennial, erect, caespitose. Culms up to 100 cm. high including the panicle, frequently much smaller, 4-5-noded, at times branched upwards. Internodes terete, striate, glabrous but scaberulous along the nerves, exserted; nodes glabrous, somewhat swollen. Leaf-sheaths shorter than the internodes, tight or somewhat lax upwards, subcompressed, striate and asperulous; ligule a short ciliate rim; auricles densely bearded; blades erect or more or less flexuous or curved, narrow, convolute, filiform, acuminate, asperulous and grooved below, upper surface scaberulous to hirtellous, up to 20 cm. long or more. Panicle lax, ovate in outline, up to 30 cm. long and 20 cm. wide; axis terete, angular and asperulous upwards; branches thin, elongate, solitary, often divided from near the base, scabrous; pedicels capillary, much thickened towards the apex. Spikelets pale yellow to green or purple-brown. Glumes unequal, subacute, more or less shortly awned, hirtellous; the lower 9-11 mm. long; the upper 10-13 mm. long. Lemma including the callus about 3.5 mm. long, becoming very dark at maturity, tuberculate-asperulous upwards; callus 0.5-0.75 mm. long, curved, acute, densely bearded; column of awns 7-11 mm. long, hairy upwards; central awn up to 5.5 cm. long, plumose except for the naked tip; lateral awns up to 25 mm. long. Anthers 4-5 mm. long.

SOUTH WEST AFRICA.

Onolongo, Barnard 42 (S); Klein Namutoni, I. 1919, Breyer TM. 20614 (T); between Klein Otavi and Okorosawe, III. 1926, Barnard (S); Grootfontein, IV. 1916, Waibel 100 (B); do., I. 1936, Boss TM. 35691 (T); Otavi, I. 1936, Von Malzahn TM. 35560 (T); Outjo, V. 1933, ter Horst TM. 31843 (T); Waterberg, I. 1937, Boss TM. 36456 (T); Omaruru,

XII. 1935, *Boss* TM. 35670 (T); Okahandja, II. 1928, *Bradfield* 268 pro parte (T); Granitbank bei Ebony, V. 1936, *Boss* TM. 36191 (T, K); Welwitsch, Khan River basin, III. 1909, *Pearson* 4468 (K); Walfishbay, IX. 1925, *de Wildeman* (K); Mount Brukkaros, III. 1931, *Sordahl* 26 (W); Sandverhaar, II. 1909, *Pearson* 4673 (K); between Keetmanshoop and Seeheim, II. 1909, *Pearson* 4673 (BH, K); Tsirub, V. 1936, *Boss* TM. 36229 (T); Klein Karas, IV. 1931; *Oertendahl* 140 (N); Karas Mountains, *Boss* TM. 36126 (T); without precise locality, *Empire Exhibition* 29 (K, W); Bumbo, im Walde, IV. 1903, *Fritzsche* 16 (B, G, N, V); Hairabib, IV. 1939, *Volk* 485 (D); Ossa, III. 1939, *Volk* 1531 (D).

BECHUANALAND PROTECTORATE.

Makarikari Lake, IV. 1931, *Pole Evans* 3274 et 3284 (K, N); Francistown, V. 1929. *Gordon* 146 (N); between Francistown and Shashi, IV. 1931, *Pole Evans* 3224 (K, N),

CAPE PROVINCE.

Little Namaqualand, Koa Vallei, Aggeneys, I. 1909, *Pearson* 4953 (K).

TYPE SPECIMEN.

Fritzsche 16 is deposited in the Botanisches Museum, Berlin-Dahlem.

ECONOMIC NOTE.

Collectors from South West Africa state that this species is a good fodder for stock.

21a. *A. gracilior* Pilger var. *intermedia* mihi,

a typo columna apice penicillata et arista media basin versus nuda differt.

SOUTH WEST AFRICA.

Keetmanshoop, IV. 1931, *Oertendahl* 158 (K, N); Damaraland, I. 1907, *Galpin et Pearson* 7402 (K, N).

TYPE SPECIMEN.

Galpin et Pearson 7402 is deposited in the Herbarium, Royal Bot. Gardens, Kew.

The facies of this variety is identical with that of the species but may be distinguished by the penicillate branching point of the awn (as in *A. uniplumis* Licht.) and the naked column.

21b. *A. gracilior* Pilger var. *Pearsonii* Henrard Crit. Rev. 3. 695 (1938); Henrard Monogr. 1. 69 (1929).

ANGOLA.

Between Mossamedes and R. Coroca, IV. 1909, *Pearson* 2249 (K, N); about 100 km. from Mossamedes, IV. 1909, *Pearson* 2395 (K); Cautas on Mossamedes Railway, IV. 1909, *Pearson* 2361 (K).

SOUTH WEST AFRICA.

Grootfontein, II. 1933, *Schoenfelder* 70 (K, N); Narebis, *Barnard* SAM. 16479-80 (K, S); Spitzkopje, I. 1937, *Boss* TM. 36357 (T) et 36371 (T) et 36374 (T); Arandis, I. 1937, *Boss* TM. 36396 (T).

TYPE SPECIMEN.

Pearson 2249 is deposited in The Herbarium, Royal Bot. Gardens, Kew.

The facies of this variety resembles that of the species but may be recognised by the naked column and the absence of a pencil of hairs at the branching-point of the awns.

22. *A. obtusa* Del. Fl. Aegypt. 31 tab. 13 fig. 3 (1813); Trin. Spec. Gram. Stip. 167 (1842); Walp. Ann. Bot. **3**. 749 (1852) excl. syn. pro parte; Steud. Syn. Pl. Glum. **1**. 144 (1854); Dur. et Schinz, Consp. **5**. 805 (1894); Stapf in Dyer, Fl. Cap. **7**. 567 (1899) excl. syn. pro parte; F. Bolus in Ann. S. Afr. Mus. **9**. IV. 233 (1915) pro parte; Marloth, Fl. S. Africa **4**. 22 tab. 7 fig. A 1-4 (1915); Dinter in Fedde, Rep. **15**. 342 (1918); Garabedian in Ann. S. Afr. Mus. **16**. II. 403 (1925) pro parte; Henrard Crit. Rev. **2**. 387 (1927); Henrard Monogr. **1**. 72 cum ic. tab. 17 (1929); Range in Fedde, Rep. **33**. 9 (1933).
A. brevifolia Steud. sec. F. Bolus in Ann. S. Afr. Mus. **9**. IV. 234 (1915) pro parte, non Steud. *A. ciliata* Desf. sec. Stapf in Dyer, Fl. Cap. **7**. 564 (1899) pro parte, non Desf. *A. Dregeana* (Nees) Trin. et Rupr. sec. Hack. in Bull. Herb. Boiss. **4**. Append. III. 18 (1896); Stapf in Dyer, Fl. Cap. **7**. 570 (1899); Dinter in Fedde, Rep. **15**. 341 (1918); Garabedian in Ann. S. Afr. Mus. **16**. II. 401 (1925) omnes pro parte, non (Nees) Trin. et Rupr. *A. uniplumis* Licht. sec. Hack. in Bull. Herb. Boiss. **4**. Append. III. 19 (1896) pro parte, non Licht. *A. sp.* sec. Bolus in Ann. S. Afr. Mus. **9**. IV. 235 (1915). *Arthratherum obtusum* (Del.) Nees, Fl. Afr. Austr. 179 (1841); Presl, Bot. Bemerck. 121 (1844). *Stipagrostis capensis* Nees in Linnæa **7**. 291 (1832); Kunth Enum. **1**. 197 (1833); Nees, Fl. Afr. Austr. 171 (1841). *Stipagrostis obtusa* Nees in Linnæa **7**. 293 (1832); Kunth Enum. **1**. 198 (1833).

Perennial, compactly caespitose. Innovations numerous. *Culms* from a few centimetres up to 50 cm. high, very slender, 1-noded, glabrous, smooth, erect or geniculate at the nodes; internodes exerted. Lower *leaf-sheaths* short, firm and persistent, glabrous or woolly near the margin, with more or less reduced blades; the upper much shorter than the internode, tight, striate, often somewhat compressed, with hyaline margins, some times lightly villous; *ligule* a short ciliate rim; auricles densely and often very long-bearded; collar smooth; blades very variable with regard to length, 1.5-20 cm. long, setaceous, convolute, rigid or subrigid, curved or flexuous, glaucous, striate, glabrous or lightly villous or scaberulous beneath, minutely villous or hirtellous on the upper surface, scarcely 0.5 mm. wide when expanded, terminating in a callus-like obtuse tip. *Panicle* very narrow, erect, contracted, but rather loose and interrupted at the base, 2.5-20 cm. long; axis terete or striate, glabrous or scaberulous upwards; branches solitary, bipartite nearly from the base, filiform, erect or somewhat spreading; branchlets scaberulous, axils glabrous; lateral pedicels short, always shorter than the glumes. *Spikelets* yellow, often flushed with purple at the base. *Glumes* sub-equal, *scaberulous dorsally with numerous rows of fine protuberances*; the lower lanceolate, obtuse, 3-nerved, scabrous on the keel, usually exceeding the upper glume in length, 8.5-12 mm. long; the upper narrowly-lanceolate, subacute, 1-3-nerved, smooth on the keel, 8-11 mm. long. *Lemma* oblong, about 3 mm. long including the callus, smooth; *callus* nearly 1 mm. long, acute, densely hairy; column of awns variable in length, 4-10 mm. long, straight or twisted; central awn scaberulous in lower half, densely plumose in upper part up to the very tip, about 2-3.2 cm. long; lateral awns naked, very fine, divaricate, 0.75-1.75 cm. long. *Pale* nerveless, broad, \pm 1 mm. long. *Anthers* 4-5 mm. long.

SOUTH WEST AFRICA.

Spitzkopje, I. 1937, *Boss* TM. 36376 (T); Arandis, I. 1937, *Boss* TM. 36397 (T); Welwitsch, I. 1907, *Galpin* et *Pearson* 7415 (BH, K, N, P, S); Haigamkhab, I. 1907, *Galpin* et *Pearson* 7424 (K, N, S); Usakos, anno 1938, *Volk* 73 (D); Rössingberge, XI. 1938, *Volk* 23a (D); Witvley, *Range* 1422 (B); between Choaberib and Gurumanas, I. 1916, *Pearson* 9598 (BH, K, S); Kwartel, IV. 1911, *Dinter* 2166 et 2171 (B); Narib, IV. 1913, *Engler* 6533 (B); Tsumis, III. 1905, *Von Trotha* 15b (B); Sendlingsgrab, I. 1908, *Hartmann* 17a (B); Gamkanas, III. 1911, *Dinter* 2001 (B); Lidfontein, III. 1911, *Dinter* 1999 (B); Bullsporter Fläche, *Dinter* 2137 (B, W); between Gamis and Bull's Mouth Pass, XII. 1915, *Pearson* 8939 (K, S); Chamisfläche, IX. 1905, *Schultze* 414 (B); Gelwater, X. 1907, *Hartmann* 17 (B); between Achterfontein and Gelwater, XII. 1915, *Pearson* 9229 (K); 20 km. south of Gründoorn, II. 1909, *Pearson* 3158 (K); between Ausis and Khuias, III. 1885, *Schenck* 219 (Z); Haalenberg, IV. 1929, *Dinter* 6303 (B, BH, K, St); Keetmanshoop, *Seidel* 2 (B); Lüderitzbucht (Angra Pequena), *Marloth* 5084b (N); do., VII. 1925, *Moss* 11516 pro parte (WR); Garub, I. 1910, *Dinter* 1056 (B); do., *Range* 523 (B); do., II.

1909, *Pearson* 4197 (K, S); Aus, III. 1885, *Schinz* 659 (B, K, Z); do., *Peyer* 26 (Z); do., *Marloth* 5084 (N, St); near Kubib, I. 1916, *Pearson* 9472 [an 9492 ?] (K, S) et 9476 (K); Kubub, *Range* 234 (B); Schakalskuppe, *Range* 1780 (B); do., II. 1909, *Pearson* 4804 (BH, K, N) et 4778 (A, BM, K, S); Buchholzbrunn, II. 1909, *Pearson* 3639 (K, Mc); Feldschuhhorn, IV. 1909, *Schäfer* 105 (B); Sandverhaar, II. 1909, *Pearson* 4663 (K); do., *Pearson* 4676 (D, K, N); do., *Pearson* 4688 (A, K); Kaukausib, *Range* 1133 et 1897 (B); Inachab, XII. 1897, *Dinter* 1109 (B, V, Z); Klein Karas, IV. 1931, *Oertendahl* 119 (N); do., VII. 1931, *Oertendahl* 563 (B); do., IX. 1923, *Dinter* 4952 (B, BH, G, K, Mc, N, S, Z); Pomona, *Marloth* 6595 (N); Holoog, I. 1916, *Pearson* 9725 (BH, K, S); Kraaikluft, XII. 1912, *Pearson* 8494 (A, BH, BM, K, N, S); Klinghardtgebirge, VIII. 1913, *Schäfer* 542-545 et 547 [omnes B]; Witpütz, *Range* 587 et 713 (B); Narudas Süd, XII. 1912, *Pearson* 8146 (BH, K); Ganus, II. 1909, *Pearson* 4504 (K); Aiais-plateau, V. 1919, *Waibel* 203 (B); Gabis, I. 1909, *Pearson* 4322 (K, N); 25 km. north of Warmbad, II. 1909, *Pearson* 4292 (K, W, Z); Dabaigabis, I. 1909, *Pearson* 4382 (D, K, N); Hohenfels, *Pfeil* 184 (B); near Raman's Drift, I. 1909, *Pearson* 4009 (A, BH, BM, K, N, S); do., *Pearson* 4053 (A, BH, K, S); north of Viols Drift, IX. 1931, *Pillans* 6396 (BH); without precise locality: Hereroland, *Lüderitz* 64 et 68 (B, Z); Namib, *Morgenstern* s.n. (B).

CAPE PROVINCE.

Little Namaqualand distr.: South of Orange River mouth, IX. 1926, *Pillans* 5707 (BH, K); south of Viols Drift, III. 1935, *Thorne* SAM. 51590 (S); Richtersveld, VIII. 1925, *Marloth* 12223 (N); between Holgat River and Orange River, *Drège* 2542 (B, K, N, S); Goodhouse, IX. 1930, *Henrici* 2195 (N); Lekkersing, IX. 1935, *Taylor* 1095 (N); Steinkopf, V. 1926, *Krapohl* H. 21862 (B, N) et *Marloth* 11222 (N) et *Marloth* 3719 (N); Kraaiwater, II. 1898, *Schlechter* 64 (A, B, BH, G, K, N, P, T, V, W, Z); Windhoek, VII. 1896, *Schlechter* 8343 (A, B, BH, BM, G, K, N, P, T, V, W, Z); Koeris Camp, X. 1928, *Pole Evans* 2238 (N); between Klipfontein and Abbevlakte, *Bolus* 9468 (BH); Buffels-river, IX. 1897, *Schlechter* 11254 (A, B, BH, BM, G, K, N, P, T, V, W, Z); near Kamabies, XII. 1897, *Pearson* 3777 (K); near Bitterfontein, XII. 1908, *Pearson* 3866 (K); Ius, IX. 1897, *Schlechter* 11405 (A, B, BH, BM, G, K, N, P, Z); south of Daunabis, XII. 1910, *Pearson* 6006 (A, K, S); Alewynsfontein, XII. 1908, *Pearson* 3334 (BM). Van Rhynsdorp distr.: Bitterfontein, XII. 1908, *Pearson* 3406 (N, T). Calvinia distr.: Between Lospers Plaats and Springbokkuil River, *Zeyher* 1815 (A, B, BH, BM, G, K, P, S, V, Z); Brakrivier, XII. 1908, *Pearson* 3902 (BH, K); between Pappekuil and Stompiesfontein, XII. 1908, *Pearson* 4965 (K). Ceres distr.: Rietpoort, *Rehmann* 3266 (Z); Gansfontein, XII. 1908, *Pearson* 3987 (K). Sutherland distr.: Tanqua Karroo, IX. 1935, *Levy* 5087 (U). Laingsburg distr.: Ngaap Kop, IX. 1926, *Compton* 3140 (BH). Prince Albert distr.: Prince Albert Road, I. 1903, *Marloth* 3055 (N); do., V. 1920, *Pillans* BH. 21798 (BH); Boterkraal, XI. 1905, *Bolus* 12431 (A, B, BH, BM, K, N); Beaufort West distr.: Nieuweveld, Bokpoort, *Drège* (B, G, K, N, P, S, V). Murraysburg distr.: Murraysburg, VIII. 1879, *Tyson* 526 (D). Graaff-Reinet distr.: Graaff-Reinet, IV. 1911, *Pillans* 1812 (K). Victoria West distr.: Victoria West, XI. 1923, *Marloth* 3075 (N). Carnarvon distr.: Carnarvon, IX. 1925, *Gill* 215 (St); Karreebergen Poort, IX. 1811, *Burchell* 1556 (G, K). Fraserburg distr.: Williston, XI. 1921, *Foley* 188 (N); between Patrysfontein and Great Brak River, *Burchell* 1520 (K, P); between Great Riet River and Stinkfontein, VIII. 1811, *Burchell* 1392 (G, K, N, P); Fraserburg, II. 1930, *Nel* in Hb. Stell. 15842 (St). Kenhardt distr.: Loog Kolk, X. 1928, *Pole Evans* 2237 (N); Louisvale, II. 1930, *Mennell* s.n. (W). Prieska distr.: Prieska, III. 1931, *Bryant* 608 (B, K, V, W); Redlands Siding, IV. 1913, *Crews* GH. 9071 (N). Philipstown distr.: Potfontein, III. 1933, *Schweickerdt* 1205 (N). Herbert distr.: Honeynestkloof, III. 1920, *Wilman* K. 2 (B, K); do., V. 1921, *Wilman* 2153 (Mc) do., XI. 1929, *Phillips* 3466 (K, N, W). Kimberley distr.: Modderivier Station, II. 1904 *Kuntze* s.n. (K); Riverton, IV. 1928, *Wilman* 2923 (Mc); Kimberley, *Rehmann* 3469 (Z) et *Tuck* s.n. (K, S). Hay distr.: Niekerk's Hoop, X. 1936, *Hafstrom* 1150 (Mc); Griquatown, II. 1937, *Wilman* s.n. (K, Mc). Gordonias distr.: Upington, IX. 1919, *Shantz* 184 (K, W); Brak River, VII. 1925, *Barnard* SAM. 36144 (S). Kuruman distr.: Kuruman,

III. 1928, *Pole Evans* 2089 (N). Vryburg distr.: Armadillo Creek, V. 1912, *Burt Davy* 13862 (N). Mafeking distr.: Inkruip, IV. 1929, *Pole Evans* 2422 (K, N); Kameelboom Camp, IV. 1929, *Pole Evans* 2405 (K, N).

ORANGE FREE STATE.

Fauresmith distr.: Jagersfontein, VI. 1927, *Smith* 4114 (K); Fauresmith, I. 1925, *Pole Evans* 1572 (N); Luckhoff, I. 1917, *Pole Evans* H. 135711 (N). Bloemfontein distr.: Pont 948 (Z); without precise locality: Olifantsfontein, *Rehmann* 3525 (B, K, V, Z).

TYPE SPECIMEN.

The type is deposited in the Institut de Botanique, University of Montpellier, France.

COMMON NAMES.

Beesgras. Bushman Grass. Fyne Twaagras. Gemsbokgras. Klein Twaagras. Klip Toagras. Small Bushman grass. Toagras(s). Twaagras.

ECONOMIC NOTES.

Many collectors report that this species is a good fodder for all kinds of stock and in some parts of South West Africa is one of the most important pasture grasses. It is very tough and lasts well (persists).

23. *A. brevifolia* (Nees) Steud. Nomencl. Bot. ed. 2. 130 (1842); Trin et Rupr. Spec. Gram; Stip. 170 (1842); Walp. Ann. Bot. 3. 749 (1852); Steud. Syn. Pl. Glum. 1. 144 (1854); Hack. in Bull. Herb. Boiss. 4. Append. III. 17 (1896); Stapf in Dyer, Fl. Cap. 7. 570 (1899); F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte; Dinter in Fedde, Rep. 15. 341 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925); Henrard Crit. Rev. 1. 58 (1926); Henrard Monogr. 1. 74 cum ic. tab. 17 (1929); Range in Fedde, Rep. 33. 8 (1933); Theron in Fedde, Rep. 40. 12 (1936).

A. geminifolia Trin. et Rupr. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte, non Trin. et Rupr. *A. obtusa* Del. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 233 (1915) pro parte, non Del. *Arthratherum brevifolium* Nees, Fl. Afr. Austr. 183 (1841).

Perennial, suffrutescent, with a much-branched woody rootstock. *Culms* up to 100 cm. high, but usually much shorter, many-noded, erect or ascending, terete, striate, slender, minutely puberulous and covered with many glands; lower internodes short, more or less aggregated, the upper gradually longer and exerted; nodes with an evanescent flake of wool. *Leaf-sheaths* tight; the lower longer or slightly shorter than the internodes, terete, striate, gland-dotted, covered with evanescent wool at the mouth and along the margins, those of the short cylindric innovations very broad and with rudimentary spiny blades; the upper sheaths much longer, shorter than the internodes, glandular or becoming more or less glabrescent; *ligule* a short ciliate rim; auricles bearded with a flake of wool; collar a more or less pubescent villous line, eventually becoming glabrous; *blades* densely striate, convolute or flat, subpungent, subrigid to very rigid, spreading, glaucous, asperulous beneath, glandular hispidulous or pubescent on the upper surface, up to 12 cm. long but usually much shorter, up to 3 mm. broad. Inflorescence exerted; peduncle terete, striate, puberulous and glandular. *Panicle* contracted, linear, somewhat spike-like but loose and interrupted at the base, up to 20 cm. long including the awns but usually much shorter; rachis striate, angular, glabrous, here and there dotted with glands; branches short, divided from the base, usually few-flowered, smooth; pedicels shorter or longer than the glumes. *Spikelets* green or yellowish, often tinged with purple. *Glumes* lanceolate, acuminate, minutely truncate, glabrous or puberulous or ciliate near the margins and glandular, unequal; the lower 8–11 (15) mm. long; the upper 11.5–15 (17) mm. long, 3–5-nerved. *Lemma* linear-oblong, smooth, with an obtusely slightly bilobed tip, including the callus 5.5–7 mm. long; *callus* very acute, pungent, up to 2–2.5 mm. long, long-hairy; column twisted, 4–9 mm. long; central awn glabrous or scantily plumose at the base, densely plumose above to the very tip, obtuse in outline, 2.3–4.0 cm. long; lateral awns naked, 1.0–1.8 cm. long. *Anthers* up to 7 mm. long.

SOUTH WEST AFRICA.

Between Keetmanshoop and Seeheim, II. 1909, *Pearson* 4590 (B, BM, BH, K, N); Klein Karas, IX. 1923, *Dinter* 4970 (BH, G, Mc, N, S, St, Z); Klein Karas to Aiais, VII. 1931, *Nertendahl* 575 (K, N); between Fish River and Orange River, XII. 1911, *Range* 1233 (B); Aiais-plateau, V. 1919, *Waibel* 202 (B); between Sjambok River and Aussenkehr, IX. 1931, *Pillans* 6469 (BH); between Modder Drift and Sjambok River, IX. 1931, *Pillans* 6444 (BH); 25 km. north of Warmbad, II. 1909, *Pearson* 4287 (K, WR, Z); 30 km. north of Raman's Drift, I. 1909, *Pearson* 4051 (BH, K, S) et 4010 (A, BH, D, K) et 4535 (K); without precise locality, *Fleck* 290a (V, Z).

CAPE PROVINCE.

Little Namaqualand distr.: Goodhouse, Orange River, IX. 1930, *Henrici* 2152 (N); between Dabainoris and Abbases, I. 1909, *Pearson* 3011 (K, D); Wortel, I. 1909, *Pearson* 3601 (A, BM, K, N, T, S) et 3626 (K) et 3632 (K, N) et 3634 (BM, N); 10 miles north-east of Bitterfontein, XII. 1908, *Pearson* 3405 (A, BM, BH, K, N, S); Silverfontein near Ookiep, X. 1830, *Drège* [2040] (B, G, K, N, O, P, V); near Springbok, XII. 1936, *Adamson* 1538 (K); Buffel Rivier, IX. 1897, *Schlechter* 11255 (A, B, BH, BM, G, K, N, P, T, V, W, Z); near Tweefontein, XII. 1908, *Pearson* 3781 (K); between Klipplaat and Bitterfontein, XII. 1908, *Pearson* 3869 (K); Zabics, XII. 1897, *Schlechter* 47 (A, BH, BM, G, K, N, P, T, V, W, Z); Kamiesberg to mouth of the Orange River, *Zeyher* 73 (A, B, G, K, N, S, Z). Calvinia distr.: Between Lospers Plaats and Springbokkuil River, *Zeyher* 1813 (A, B, BH, BM, G, K, N, P, St, Z). Prince Albert distr.: Between Dwyka River and Zwartbulletje, *Drège* (BM, G, K, N, O, P, S, V). Without precise locality: Prom. bon. Spei, 1862, *Pappe* (BM).

TYPE SPECIMEN.

Drège (lectotype!) is deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAMES.

Bosjes-gras. Twa-gras. T'waagras.

ECONOMIC NOTES.

Drège states that "die Körner dieses Grases werden als Grütze von den Hottentotten sehr geschätzt."

REMARKS.

Pearson 4590 appears to be a large-flowered form of this species. The glumes are fairly large (I = 15 mm., II = 17 mm.) and pubescent towards the margins: the lemma and central awn are longer than in most other specimens seen. In general characters however this gathering agrees well with *A. brevifolia*.

24. **A. uniplumis** Licht. in Roem. et Schult., Syst. Veg. 2. 401 (1817); Trin. Gram. Unifl. et Sesquifl. 180 (1824); Trin. in Mem. Acad. Imp. Sc. Petersb. 6. 1. 89 (1829); Kunth, Enum. 1. 195 (1833); Trin. et Rupr. Spec. Gram. Stip. 172 (1842); Walp. Ann. Bot. 3. 750 (1852); Steud. Syn. Pl. Glum. 1. 144 (1854); Hack. in Engl. Bot. Jahrb. 11. 400 (1889); Dur. et Schinz, Consp. 5. 809 (1894); Hack. in Bull. Herb. Boiss. 4. Append. III. 19 (1896) pro parte; Stapf in Dyer, Fl. Cap. 7. 569 (1899) pro parte; F. Bolus in Ann. S. Afr. Mus. 9. IV. 234 (1915) pro parte; Dinter in Fedde, Rep. 15. 343 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 405 (1925) pro parte; Henrard Crit. Rev. 3. 643 (1928); Henrard Monogr. 1. 77 cum ic. tab. 19 (1929); Range in Fedde, Rep. 33. 10 (1933); Obermeijer, Schweickerdt et Verdoorn in Bothalia, 3. II. 227 (1937). *A. uniplumis* Licht. var. *Neesii* Walp. sec. Garabedian in Ann. S. Afr. Mus. 16. II. 406 (1925), non Walp. *Arthratherum uniplume* Nees, Fl. Afr. Austr. 181 (1841).

Perennial, densely caespitose. Culms including the inflorescence up to 75 cm. high or more, erect, 3-4-noded, simple or branched upwards; internodes striate and terete,

smooth or scaberulous; nodes glabrous. *Leaf-sheaths* reduced to leafless scales, or the upper tight, terete, striate, smooth or scaberulous upwards, shorter than the internodes; ligule a ciliate rim; auricles densely bearded; collar glabrous; *blades* setaceous, convolute, curved or flexuous, up to 10 cm. long, glabrous and striate on the lower surface, scaberulous on the upper surface with usually a few long hairs towards the ligule. *Panicle* long-exserted, fairly compact to diffuse; axis terete in lower part, angular and scaberulous upwards; branches spreading or suberect, usually solitary but branched near the base, almost smooth; pedicels capillary, often sinuate, scaberulous, much thickened upwards. *Spikelets* pale yellow to purplish or purplish-brown. *Glumes* glabrous or with scattered marginal hairs, almost papery, unequal; the lower 8–9 mm. long; the upper 9–11 mm. long. *Lemma* cylindric, including the callus about 4 mm. long, smooth, slightly tuberculate upwards; *callus* about 1 mm. long, acute, densely bearded; column of awns about 5 mm. long, densely penicillate at the apex, otherwise glabrous; central awn up to 2.5 cm. long, naked in its lower part, densely plumose upwards; lateral awns up to 12 mm. long, very fine.

SOUTH WEST AFRICA.

Hoarusib River, west of Klein Otavi, III. 1926, *Barnard* SAM. 33278 (S); Ombombo to Kaoko Otavi, II. 1926, *Barnard* SAM. 33310 (S); Omaheke, IV. 1913, *Dinter* 2883 (B); Andoni, *Barnard* 812 (S) et 817 (S); Otjitambi, *Schlettwein* 42a (B); Grootfontein, *Bail* 7 (B); Otjituo, II. 1906, *Seiner* 21 [671] (B, W); Otjiwarongo, III. 1928, *Bradfield* 268 pro parte (N); Ozondjache, XII. 1938, *Volk* 542 (D); Usakos, IV. 1939, *Volk* 74 (D); Fockshof, IV. 1938, *Volk* A. 158 (D); between Okatambeke and Owinauanaua, IV. 1911, *Seiner* 443 (B); Okatambeke, II. 1911, *Seiner* 168 (B); Omaruru, VI. 1916, *Waibel* 122 (B); Ameib, II. 1885, *Belck* 53 (B, Z); Okahandja, XII. 1910, *Dinter* 1638 (B) et 1530 (B) et *Grossarth* 40 (B) et *Bertling* 5 (B); between Windhuk and Karibib, III. 1910, *Mücke* 66 (N); Ababes, XII. 1915, *Pearson* 9174 (K, S) et 9182 (K); between Kubas and Ababes, IV. 1913, *Engler* 6133 (B, K); Otjimbingue, V. 1886, *Marloth* 1330 (A, O); Windhuk, III. 1905, *Trotha* 116 (B) et *Bohr* 14 (B) et I. 1916, *Pearson* 9628 (K, S); Awas Mountains, I. 1916, *Pearson* 9649 (BH, K, S); 100 km. east of Walfishbay, *Wyley* s.n. (V); Rehoboth to Aub, IV. 1911, *Dinter* 2221 (B); between Nauchas and Areb, I. 1916, *Pearson* 9023 (BH, K, S, WR); Areb, III. 1908, *Hartmann* 10c (B); Sendlingsgrab, I. 1908, *Hartmann* 10b et 10d (B); Oas, *Polizeistation* 31 (B); between Gamis and Bull's Mouth Pass, *Pearson* 8940 (K); Gamis, XII. 1915, *Pearson* 8973 (K); Zeskameelboom, *Dinter* 2066 (B); between Voigtsgrund and Breckhorn, XII. 1915, *Pearson* 9350 (BH, K, S); between Voigtsgrund and Ganaams, XII. 1915, *Pearson* 9364 (K) et 9390 (K); Gründoorn, II. 1909, *Pearson* 4555 (A, D, K, N, S, Z); Awasab, *Hartmann* 10a (B); Horas, *Hartmann* 10 (B); Mount Brukkaros, II. 1931, *Sordahl* 15 (B, W) et IV. 1931, *Sordahl* 43 (B, W); Kunyas, V. 1907, *Range* 354 (B); between Ausis and Khuias, *Schenck* s.n. (V); Byzondermaid, I. 1885, *Schinz* 660 (Z); Kunub, IV. 1911, *Range* 1015 (B); between Gellap and Great Fish River, XII. 1915, *Pearson* 9285 (K); Garinai, *Eichler* 35 (B); Lüderitzbucht (Angra Pequena), *Schinz* 662 (Z) et VII. 1903, *Schultze* 46 (B); Kuibis, V. 1909, *Range* 656 (B); Buchholzbrunn, II. 1909, *Pearson* 3655 (BH, K); Sandverhaar, *Pearson* 3704 (N) et 4620 (K) et 4603 (K); Seeheim to Kalkfontein, II. 1909, *Schäfer* 58 (B); Inachab, XI. 1897, *Dinter* 1089 (Z); Wasserfall, I. 1913, *Pearson* 8606 (BH, N); Little Karas Mountains, I. 1916, *Pearson* 9724 (BH, K, S); Sabiesis, II. 1909, *Pearson* 4117 (BH, D, K, N, S); Great Karas Mountains, I. 1913, *Pearson* 8499 (BH, D, G, K, W) et 8500 (BH, K, S) et *Blank* 61 (B); Naossonabis, XI. 1909, *Range* 802 (B); Dabaigabis, I. 1909, *Pearson* 4381 (A, K, N, S); Warmbad, I. 1909, *Pearson* 4027 (K, S, T).

BECHUANALAND PROTECTORATE.

Makarikari Lake, IV. 1931, *Pole Evans* 3283 (B, K, N); Artesia, IV. 1931, *Pole Evans* 3167 (K, N) et 3172 (N); Pitsani, IV. 1929, *Pole Evans* 2344 (K, N); Kutje, V. 1928, *Nobbs* 60 (U); Letlaking, V. 1928, *Nobbs* 23 (U); Kaotwe, IV. 1930, *van Son* TM. 28608 (T); between Malopo and Kaotwe, V. 1928, *Nobbs* 74 (U); Kauke, III. 1930, *van Son* TM 28610 (T); between Sekuma and Kooa, I. 1905, *Schultze* 342b (B).

CAPE PROVINCE.

Gordonia distr.: Upington, VII. 1925, *Barnard* SAM. 86146 (S); do., VIII. 1923, *Borcherds* H. 21524 (N); near Spitzkop, IV. 1928, *Pole Evans* 2178 (N). Kenhardt distr.: Aughrabies Falls, IV. 1936, *Leipoldt* BH. 21754 (BH). Hay distr.: Eitalersfontein, *Rehmann* 3346 (B, K, Z); Griquatown, anno 1928, *Conradie* 4 (St); near Griquatown, III. 1920, *Pole Evans* 26 (K). Herbert distr.: Witkoplaagte, IV. 1937, *Wilman* 4198 (B, K, N, V, Z). Kimberley distr.: Modderivier, II. 1894, *Kuntze* s.n. (B); Kenilworth, IX. 1901, *Galpin* 6319 (N); Riverton, IV. 1914, *Wilman* 690 (Mc). Barkly West distr.: Barkly West, II. 1921, *Wilman* 2142 (Mc). Kuruman distr.: Kuruman, III. 1928, *Pole Evans* 2062 (N) et 2094 (N, W); do., *Dedman* in Hb. Stell. 10052 (St); without precise locality: *Lichtenstein* 50 (60 ?), C. b. Sp., (B); L. Bushmanland, *Marloth* 3721 (N).

ORANGE FREE STATE.

Boshof distr.: Smitskraal, IV. 1911, *Burt Davy* 10123 (N); Kroonstad distr.: Bothaville, I. 1933, *Goossens* 1172 (B, N).

TRANSVAAL PROVINCE.

Pretoria distr.: Between Elandsrivier and Klippan, *Rehmann* 5113 (B, K). Lydenburg distr.: Near Lydenburg, *Atherstone* s.n. (A, K, S). Waterberg distr.: Warmbaths, II. 1936, *Irvine* 41 (N). Zoutpansberg distr.: Zoutpan, IV. 1934, *Schweickerdt et Verdoorn* 630 (B, N); Messina, *Pole Evans* 1906 (N).

TYPE SPECIMEN.

Lichtenstein 50 (60 ?) is deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAMES.

Blinkaar. Bushman grass. Buschmanngras. Langbeen Twaa. Large Bushman grass. Silwergras. Soetgras. T'waagras.

ECONOMIC NOTES.

This species constitutes one of the main fodder-grasses of the Namib where it remains green only for a very short period; it is also eaten in the dried state by stock and game. In the Griqualand West area it is also considered an excellent fodder and as it does not produce stools, it may be cut and stored as hay or silage. In the pre-flowering and flowering stage this grass is sweet, but gradually becomes less so after frost and winter rain. In the wilted condition this species has been found to contain prussic acid.

- 24a. *A. uniplumis* Licht. var. *Neesii* Trin. et Rupr. Gram. Stip. 173 (1842); Walp. Ann. Bot. 3. 750 (1852); Dur. et Schinz, Consp. 5. 809 (1894); Dinter in Fedde, Rep. 15. 343 (1918); Henrard Crit. Rev. 3. 646 (1928); Henrard Monogr. 1. 77 (1929).

A. uniplumis Licht. sec. Stapf in Dyer, Fl. Cap. 7. 569 (1899) pro parte; Stent in Bothalia 1. IV. 278 (1924), non Licht.

The facies of this variety greatly resembles that of the species. The glumes however are longer and the lemma is somewhat larger than in the species. Furthermore the central awn is fairly robust, usually dark in colour and plumose to the base, the column however is glabrous.

CAPE PROVINCE.

Colesberg distr.: Near Colesberg, *Drège* 901 (B). Kimberley distr.: Rietpan, III. 1917, *Potgieter* TM. 19179 (T); Warrenton, IV. 1917, *Pole Evans* H. 11623 (K); Warrenton, II. 1926, *Smith* 2347a (N). Barkly West distr.: Driefontein, XII. 1936, *Acocks* 1468 (Mc). Hay distr.: Near Postmasburg, VI. 1929, *Uys* G. 3 (N). Vryburg distr.: Vryburg, III. 1920, *Stent* H. 21515 et H. 21449 (N); do., II. 1923, *Rodger* BH. 21801 (BH, Mc); do., II. 1916, *Viljoen* H. 12044 (K); Armoedsvlakte, IV. 1912, *Sharpe* H. 7473 (N); do., III.

1924, *Henrici* 89 (N); do., XII. 1920, *Mogg* in Hb. Stell. 12543 (St). Mafeking distr.: Mafeking, IV. 1929, *Pole Evans* 2426 (K, N) et 2441 (K, N) et IV. 1929, *Pole Evans* 2397 (K, N, W). Kuruman distr.: Witdraai, III. 1917, *Pole Evans* 2096 (N).

BECHUANALAND PROTECTORATE.

Nkate, IV. 1931, *Pole Evans* 3297 (K) et 3298 (N) et 3302 (K); Metsematluko, IV. 1928, *Nobbs* 25 (U); Mochudi, I. 1914, *Rogers* 6315 (BH, K, N, T); do., IV. 1914, *Harbor* BH. 21800 (BH).

ORANGE FREE STATE.

Bloemfontein distr.: Bloemfontein, *Rehmann* 3722 (B, BM, K, Z); Glen, IV. 1926, *School of Agriculture* NH. 3446 (N). Hoopstad distr.: Wesselsbron, I. 1933, *Goossens* 1248 (B, N); Hoopstad, III. 1909, *Potts* 1149 (GU). Kroonstad distr.: Bothaville, IV. 1931, *Boshoff* 2 (N). Boshoff distr.: Bethel-Pella, IV. 1931, *Wolff* 12 (N). Between Kimberley and Bloemfontein, *Buchanan* 291 (K, S).

TRANSVAAL PROVINCE.

Bloemhof distr.: Christiana, III. 1912, *Burt Davy* 12975 (N); Smitskraal, IV. 1911, *Burt Davy* 10123 pro parte (N); Schweizer Reneke, II. 1904, *Burt Davy* 1627 (N). Wolmaransstad distr.: Wolmaransstad, IV. 1931, *Liebenberg* 2437 (N, W); Maquassi, II. 1918, *Rogers* 20654 (G, Z). Zoutpansberg distr.: Messina, X. 1929, *Turner* 23 (N); do., II. 1919, *Rogers* 22545 (T, Z).

TYPE SPECIMEN.

Drege from Colesberg deposited in the Botanisches Museum, Berlin-Dahlem? Perhaps there is a specimen in the Trinius Herbarium, Leningrad which should be regarded as the type. I have not seen this sheet.

24b. *A. uniplumis* Licht. var. *Pearsonii* Henr. Crit. Rev. 3. 647 (1928); Henrard Monogr. 1. 77 (1929).

A. Dregeana Trin. et Rupr. sec. Dinter in Fedde, Rep. 15. 341 (1918) pro parte, non Trin. et Rupr. *A. uniplumis* Licht. sec. Hack. in Bull. Herb. Boiss. 4. Append. III. 19 (1896); Stapf in Dyer, Fl. Cap. 7. 569 (1899); Garabedian in Ann. S. Afr. Mus. 16. II. 405 (1925) omnes pro parte, non Licht.

This variety greatly resembles the species but may be recognised by the column of the awns which is plumose in its upper part (at times so almost from the base). The central awn is not as rigid and bristlelike as in the var. *Neesii*, furthermore the latter has larger glumes.

ANGOLA.

Between Gambos and Cabama, V. 1909, *Pearson* 2487 (K).

SOUTH WEST AFRICA.

Ondongo, *Barnard* SAM. 32241 (S); Grootfontein, II. 1933, *Schoenfelder* 98 (K, N); Omatope, II. 1886, *Schinz* 659 (V, Z); Blockfontein, V. 1939, *Volk* 1694 (D); Otjiwarongo, XII. 1938, *Volk* 394 (D); Otjiputo, II. 1939, *Volk* 1230 (D); Otjimbingue, *Marloth* 1330 (B, V); Gobabis, II. 1906, *Kupper* 60 (B); without precise locality, *Wembley Exhibition* 29 (B, BH, S).

BECHUANALAND PROTECTORATE.

Makarikari Lake, IV. 1931, *Pole Evans* 3287 (K, N). Mochudi, I. 1914, *Rogers* 6596 (A, K, T, Z).

CAPE PROVINCE.

Kimberley distr.: Kimberley, *Rehmann* 3470 (K, Z).

ORANGE FREE STATE.

Without precise locality, *Buchanan* 69 (D, K, S).

TYPE SPECIMEN.

Pearson 2487 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

25. **A. gonatostachys** *Pilger* in Engl. Bot. Jahrb. **48**. 343 (1912); *Dinter* in Fedde, Rep. **15**. 341 (1918); *Garabedian* in Ann. S. Afr. Mus. **16**. II. 402 (1925); *Henrard Crit. Rev.* **1**. 205 (1926); *Henrard Monogr.* **1**. 81 cum ic. tab. 20 (1929); *Range* in Fedde, Rep. **33**. 8 (1933); *Theron* in Fedde, Rep. **40**. 30 (1936) [*sphalm. gonostachys*].

Perennial, densely caespitose, tufts 2-3.5 cm. high. *Culms* up to 10 cm. long, exserted beyond the small tussocks, somewhat geniculate, 1-noded; lower internode exserted, 5-6 cm. long, slender, terete, thickened upwards towards the node; upper node hairy. Lower *leaf-sheaths* reduced to yellowish broad scales, sulcate-striate, glabrous or scantily woolly along the margins, the upper sheath partly embracing the inflorescence, scaberulous and leafless; *ligule* a ciliate rim; auricles densely long-bearded; blades up to 2 cm. long, involute, obtuse, striate and sulcate, scaberulous on the lower surface, with fairly long hairs arising dorsally between the longitudinal ridges, upper surface hirtellous, curved, glaucous. Peduncle very short. *Panicle* almost sessile, sheathed by the uppermost sheath, 3-4 cm. long, spike-like; axis striate and pubescent; lower branches binate, the upper solitary. Pedicels clavate and hairy near the apex. *Spikelets* pallid, somewhat secund. *Glumes* subequal, 7-9 mm. long, lanceolate, acuminate, the lower distinctly scaberulous. *Lemma* including the callus about 4 mm. long; *callus* 1 mm. or somewhat longer, acute, shortly bearded, but long-bearded at the base of the lemma; column of awns up to 4 mm. long; central awn about 1 cm. long, glabrous at the base, densely plumose in its upper part up to the tip; lateral awns about 7 mm. long.

SOUTH WEST AFRICA.

Rotekuppe, I. 1907, *Range* 188 (B); do., I. 1910, *Dinter* 1022 (B); Guos, Küstenwüste, IX. 1911, *Range* 1177 (B, N).

TYPE SPECIMEN.

The Syn-types are deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAME.

Kleines Buschmanngras.

26. **A. lanipes** *Mez* in Fedde, Rep. **17**. 153 (1921); *Garabedian* in Ann. S. Afr. Mus. **16**. II. 403 (1925); *Henrard Crit. Rev.* **2**. 285 (1927); *Henrard Monogr.* **1**. 81 (1929); *Theron* in Fedde, Rep. **40**. 30 (1936).

Perennial, densely caespitose, dwarf, including inflorescence up to 10 cm. high. Lower *leaf-sheaths* pallid, striate, dorsally glabrous but densely woolly lanate towards and on the margins with white hairs, margins of leaf-sheaths upwards hyaline, upper leaf-sheaths densely woolly all over the dorsal surface, only the stout midrib clearly visible; *ligule* a fringe of woolly hairs; *blades* about 0.5-1.0 cm. long, somewhat recurved, linear, obtuse, glabrous and striate, glaucous, apparently terete but the margins conduplicate and somewhat involute. Culm 1-noded (the lowermost node sheathed but not exserted.) Axis terete, glabrous somewhat thickened towards the node. *Sheath* arising at the upper node in the axil of which the inflorescence appears to arise, narrowly lanceolate, glaucous, glabrous, striate, with a much-reduced blade. *Inflorescence* \pm 4-flowered, a lax sub-simple panicle, with the branchlets at the base of the inflorescence bearing 1-2 spikelets. Rhachis sub-compressed, striate, flexuous, minutely scaberulous. Pedicels likewise, somewhat thickened towards the apex. *Glumes* subequal, three-nerved; the lower slightly shorter than the upper, about 9-9.5 mm. long, with minutely scaberulous lines on the outer surface not

unlike those found in *A. obtusa* Del.; the upper smooth and glabrous, margins hyaline. *Lemma* \pm 6 mm. long including the callus; *callus* acute, densely hairy, about 2 mm. long; column of awn 2.0 mm. long, twisted, glabrous. Central awn plumose towards the apex, naked and glabrous below and at the point of insertion of the lateral filiform glabrous 9 mm. long awns. *Anthers* 3 mm. long.

SOUTH WEST AFRICA.

Near Lüderitzbucht, west of Kuibis, *Range* 1822 (B).

TYPE SPECIMEN.

Range 1822 (unicum?) is deposited in the Botanisches Museum, Berlin-Dahlem.

This species is very closely related to *A. gonatostachys* Pilger and differs from it in several minor points. The facies of the two species concerned is very similar. A wider range of material of these two species may prove them to be conspecific.

27. **A. Dregeana** (Nees) Trin. et Rupr. Spec. Gram. Stip. 169 (1842); Walp. Ann. Bot. 3. 749 (1852); Steud. Syn. Pl. Glum. 1. 144 (1854); Dur. et Schinz, Consp. 5. 802 (1894); Stapf in Dyer, Fl. Cap. 7. 569 (1899) excl. syn. pro parte; Dinter in Fedde, Rep. 15. 341 (1918); Garabedian in Ann. S. Afr. Mus. 16. II. 401 (1925) pro parte; Henrard Crit. Rev. 1. 154 (1926); Henrard Monogr. 1. 83 cum ic. tab. 22 (1929); Range in Fedde, Rep. 33. 8 (1933); Theron in Fedde, Rep. 40. 20 (1936).

A. obtusa Del. sec. Hack. in Bull. Herb. Boiss. 4. Append. III. 19 (1896) non Del.; Garabedian in Ann. S. Afr. Mus. 16. II. 403 (1925) pro parte, non Del. *Stipagrostis Dregeana* Nees, Fl. Afr. Austr. 172 (1841); Presl, Bot. Bemerk. 121 (1844).

Perennial, densely caespitose, much-branched at the base. *Culms* slender, erect or geniculately ascending, simple, 1-3-noded, the lowermost node basal or almost so, up to 25 cm. high including the awns; internodes terete or somewhat compressed, smooth and glabrous, usually exserted; nodes glabrous. *Leaf-sheaths* very tight, distinctly striate, slightly scaberulous, shorter than the internodes: the lower broad, pallid, firm and persistent, much-reduced and scale-like, bearing very short blades; *ligule* a short ciliolate rim; auricles pubescent; collar glabrous; blades setaceous, convolute, subacute, up to 12.5 cm. long, fairly rigid, glabrous and smooth beneath, more or less hirtellous or pubescent on the upper surface. *Panicle* erect, or somewhat nodding at the summit, lax and loose, up to 12 cm. long including the awns; rhachis smooth, grooved; branches usually binate, smooth; branchlets 1-2-flowered; the branches, branchlets and pedicels rather capillary and often flexuous. *Spikelets* yellowish and purple. *Glumes* linear-lanceolate, subacuminate, subequal, 3-nerved; the lower 11-13 mm. long, acuminate, purple towards the base, minutely scaberulous on the keel towards the apex, towards the apex often a few scattered minute hairs, in the young state dorsally often somewhat shortly hairy, hairs deciduous; the upper 11-13 mm. long, obtuse, emarginate or distinctly bifid, mucronate from the sinus, minutely scaberulous towards the apex, otherwise glabrous, purple towards the base. *Lemma* oblong-cylindric, glabrous, purplish, including the callus about 4 mm. long; *callus* acute, densely hairy, 1-1.5 mm. long; column of awns about 4 mm. long, twisted, glabrous; central awn 3-4 cm. long, feathery above the middle to the very tip, plumose region obtuse in outline; lateral awns naked or very nearly so, up to 17 mm. long. *Anthers* 5.5-6 mm. long.

SOUTH WEST AFRICA.

North of Lüderitzbucht, X. 1906, *Range* 8 (B); Lüderitzbucht (Angra Pequena), Hermann 49 (B); do., 1907, *Range* 491 (B); do., IV. 1909, Marloth 4664 (K, N); do., Galpin et Pearson 7395 (K); do., VII. 1925, Moss 11518 (K); do., Peyer 4 (Z); Pomona, V. 1929, Dinter 6344 (B, D, G, K, St); do., VI. 1929, Dinter BH. 21797 (BH); Klinghardtgebirge, VIII. 1913, Schäfer 512 (B); Buchberge, VIII. 1929, Dinter 6602 (B, BH, K, St); Hereroland, 1887, Nels 72 (Z).

CAPE PROVINCE.

Little Namaqualand distr.: Near mouth of Orange River, X. 1830, *Drège* (2543) (B, BM, G, K, N, O, P, V); Groot Derm, X. 1926, *Pillans* 5615 (BH, K, N); Witbank, X. 1926, *Pillans* 5217 (BH, N).

TYPE SPECIMEN.

Drège 2543 is deposited in the Botanisches Museum, Berlin-Dahlem.

28. **A. garubensis** *Pilger* in Engl. Bot. Jahrb. **48**. 344 (1912); Dinter in Fedde, Rep. **15**. 341 (1918); Garabedian in Ann. S. Afr. Mus. **16**. II. 402 (1925); Henrard Crit. Rev. **1**. 192 (1926); Henrard Monogr. **1**. 80 cum ic. tab. 21 (1929); Range in Fedde, Rep. **33**. 8 (1933); Theron in Fedde, Rep. **40**. 8 (1936).

A. dregeana Trin. et Rupr. sec. F. Bolus in Ann. S. Afr. Mus. **9**. IV. 234 (1915) pro parte, non Trin. et Rupr.

Perennial, laxly caespitose, from a much-branched almost woody rootstock. Innovations erect or irregularly ascending, intra- or extravaginal. Culms erect or somewhat ascending, rather thin and elegant if compared with the robustly-branched rootsystem, terete, smooth, 2-3-noded; internodes terete, glabrous, exserted; nodes glabrous. Lower leaf-sheaths reduced to pale striate glabrous scales, bearing much-reduced leaf-blades; the upper tight, shorter than the internodes, glabrous and terete below, striate upwards; ligule a minute ciliate rim; auricles minutely pubescent or glabrous; collar glabrous; blades very narrow, linear, convolute, setaceous, acute and subpungent, rather rigid and curved (almost wiry), up to 12 cm. long, glabrous and striate beneath, hirtellous on the upper surface, glaucous, gradually tapering to a point. Panicle shortly exserted, up to 20 cm. long including the awns, somewhat depauperate, very lax and open; rhachis terete and smooth below, rather angular and scaberulous upwards; axils glabrous; lower branches solitary or 2-3-nate from the base, the upper solitary, all few-flowered and scaberulous; pedicels minutely scaberulous, subclavate, as long as or shorter than the glumes. Spikelets erect, pallid but purplish towards their base. Glumes lanceolate, glabrous; the lower up to 12 mm. long, shortly bidentate at the subobtuse apex; the upper subacute, 12.5-15 mm. long. Lemma smooth, including the callus about 5.5 mm. long; callus 1.5 mm. long, hairy, acute; column of awns 8-10 mm. long, twisted; central awn up to 40 mm. long, naked in the lower third or plumose almost to the base, plumose to the very tip, slender and acute in outline; lateral awns naked, very thin, up to 15 mm. long.

SOUTH WEST AFRICA.

Kuniguberge, X. 1912, *Range* 1069 (B); 18 km. west of Aus, II. 1909, *Pearson* 4213 (BH, K); Garub, X. 1907, *Range* 508 (B, BM, K, N); do., X. 1907, *Range* 536 (B).

TYPE SPECIMEN.

Range 508 and 536 are deposited in the Botanisches Museum, Berlin-Dahlem.

29. **A. sericans** *Hack. apud Schinz* in Bull. Herb. Boiss. **3**. 381 (1895); Stapf in Dyer, Fl. Cap. **7**. 563 (1899); Henrard Crit. Rev. **3**. 554 (1928); Henrard Monogr. **2**. 158 cum ic. tab. 61 (1932); Theron in Fedde, Rep. **40**. 17 (1936).

Perennial, densely caespitose. Culms simple, erect, terete, up to 75 cm. high, very slender, 1-noded. Leaf-sheaths very tight, striate, glabrous or hairy all over except in the region just above the nodes, shorter than or exceeding the internodes; ligule ciliate; auricles bearded; blades finely filiform, setaceous, strictly erect, convolute, acute, up to 30 cm. long or even almost as long as the culms, glaucous, glabrous or hairy below, glabrous or hispidulous above, 0.5-1.0 mm. wide, strongly nerved. Panicle erect, dense, up to 20 cm. long, the base of the panicle sheathed by a submembranous thinly villous light-brown bract, the upper branches sparingly branched; branchlets and pedicels hairy or glabrous, the latter much shorter than the glumes. Glumes subequal, villous, linear-lanceolate,

acuminate, 3-nerved, with sparingly hairy or hyaline tips; the lower 10–15 mm. long; the upper 12–16.5 mm. long. *Lemma* purple, smooth, slightly scaberulous towards the apex, linear-lanceolate, including the callus up to 7 mm. long, produced without an articulation into the column; *callus* about 1–1.5 mm. long, acute, densely hairy; column 2–3.5 mm. long, twisted, hairy; central awn divergent or spreading, up to 24 mm. long, densely but shortly plumose except for the scabrid apex; lateral awns resembling the central, but only up to 18 mm. long. *Pale* 2.5 mm. long, obtuse, nerveless. *Anthers* about 5 mm. long. *Stigmas* pale yellow, up to 2.5 mm. long. *Caryopsis* linear, 4 mm. long, 0.3 mm. wide, pale brown.

TRANSSVAAL PROVINCE.

Standerton distr.: Standerton, *Rehmann* 6793 (B, BH, BM, K, V, Z). Vereeniging distr.: Leeuwkuil Pasture Research Station, III. 1937, *Bunting* 137 (K, N, WR); do., IX. 1937, *R. Story* in NH. 24574 (B, BM, K, N, V, W, Z); do., III. 1939, *R. Foster* in NH. 24575 (B, BM, K, N, V, W, Z).

TYPE SPECIMEN.

Rehmann 6793 is deposited in the Naturhistorisches Museum, Vienna.

REMARKS.

A very rare species apparently with a limited geographic distribution. Until the very welcome recent rediscovery of this plant by Mr. R. Story (*Bunting* 137) the author of the present paper believed this plant to have been of hybrid origin. *Rehmann* 4046 from Pretoria cited by Stapf in Dyer, Fl. Cap. 7. 563 (1899) under this species very probably does not belong here. I do not remember seeing this number and possibly the locality indicated on the sheet is incorrect, as *A. sericans* is so far only known to occur in the true Highveld area of the Transvaal.

The species bears a strong resemblance to *A. capensis* Thunb. var. *Dieterleniana* mihi with which it may readily be confused. Dissection of the spikelets however immediately reveals that the species in question belong to different sections of the genus.

30. **A. Sciurus** Stapf in Dyer, Fl. Cap. 7. 557 (1899); Stent in Bothalia 1. IV. 277 (1924); Henrard Crit. Rev. 3. 548 (1928); Henrard Monogr. 2. 164 cum ic. tab. 65 (1932).

Robust erect *perennial*, up to 140 cm. high. *Culms* arising from a short rhizome, about 4–5-noded, simple; internodes included or exserted, up to 25 cm. long but often much shorter, almost glabrous to densely adpressedly woolly just below the nodes, terete, smooth or somewhat striate towards the nodes; nodes glabrous, not very conspicuous. *Leaf-sheaths* crowded near the base, striate, glabrous or more or less fugaciously woolly, tight; *ligule* a line of very short hairs obscured by the dense aggregation of wool at the mouth of the leaf-sheath, more rarely the mouth of older leaf-sheaths almost glabrous; *blades* linear, acute, setaceously convolute, up to 60 cm. long or even longer, smooth on the lower surface, markedly striate and finely asperulous on the upper surface, about 5 mm. wide or less at the base. *Panicle* dense, contracted, at times almost spike-like, up to 45 cm. long but often shorter, erect; rhachis stout, smooth; branches fascicled, the lowest up to 20 cm. long, remotely and repeatedly branched; branchlets filiform to capillary, scaberulous. *Spikelets* pallid or tinged with purple, glabrous. *Glumes* 1-nerved, very unequal, fairly thin; the lower lanceolate oblong, acute, 5–7 mm. long, minutely scaberulous towards the apex; keel prominent and minutely scabrous; the upper linear-oblong, 11–13 mm. long, shortly mucronate from a bifid apex. *Lemma* linear, up to 12 mm. long, smooth, obscurely beaked; *callus* 1–1.5 mm. long, rounded and obtuse, densely hairy; awns subequal, the central up to 23 mm. long, the lateral up to 20 mm. long. *Pale* 1.5 mm. long. *Lodicules* few-nerved, about 1.5 mm. long. *Anthers* 6 mm. long, anther-cells minutely apiculate.

NATAL PROVINCE.

Estcourt distr.: Colenso, III. 1894, *Kuntze* s.n. (K, N); without precise locality, *Gerrard* 471 (BM, K, N) and *Gerrard et McKen* 161 (D, N).

TRANSVAAL PROVINCE.

Carolina distr.: Waterval Boven, II. 1904, *Burt Davy* 1449 (N); Badplaats, II. 1926, *Pole Evans* 1967 (N); between Machadodorp and Carolina, II. 1908, *Mundy* H. 4292a (N). Lydenburg distr.: Machadodorp, III. 1934, *Pole Evans* 3688 (N). Waterberg distr.: Zebediela's Kraal, *Nelson* 26 (K, N).

TYPE SPECIMEN.

Nelson 26 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

REMARKS.

The amount of wool (pubescence) on the internodes is variable. Some specimens (*Burt Davy* 1449) have almost glabrous internodes. The elongated obtuse callus and the absence of an articulation in the lemma however, provide a good means of distinguishing the species.

31. **A. bipartita** (Nees) Trin. et Rupr. Spec. Gram. Stip. 144 (1842); Walp. Ann. Bot. 3. 745 (1852); Steud. Syn. Pl. Glum. 1. 140 (1854); Dur. et Schinz, Consp. 5. 801 (1894); Medley-Wood, Natal Plants 5. IV. tab. 483 cum descr. (1908); Phillips in Ann. S. Afr. Mus. 16. 347 (1917); Stent in Bothalia 1. IV. 277 (1924); Henrard Crit. Rev. 1. 54 (1926); Henrard Monogr. 2. 194 cum ic. tab. 89 (1932).

A. aequiglumis Hack. sec. Medley-Wood, Natal Plants 2. tab. 197 cum descr. (1904), non Hack. *Chaetaria bipartita* Nees, Fl. Afr. Austr. 187 (1841).

Perennial, densely caespitose, with a short erect or oblique rhizome. *Culms* erect or ascending, including the inflorescence up to 65 cm. high, but usually much smaller, simple, terete or compressed below, glabrous or puberulous, few-noded; internodes exerted, striate; nodes glabrous. *Leaf-sheaths* shorter than the internodes, compressed, firm, striate, persistent, glabrous or minutely puberulous between the nerves, the upper lax and smooth. *Ligule* a densely ciliate rim; auricles long-bearded; collar more or less scaberulous; *blades* narrow, linear, acute, up to 20 cm. long, usually very much shorter, up to 2 mm. wide when expanded, glaucous, rigid, curved and folded, smooth or scaberulous on the lower surface, scabrous on the upper surface, strongly nerved, margin minutely scabrous. *Panicle* effuse, up to 30 cm. long (though usually much smaller), and about as broad, very lax; rhachis straight or somewhat flexuous, angular, striate, very scabrous upwards; branches spreading, solitary and distant, often branched again into 2 to several branches just above the base, axils pubescent only, naked over a long distance, scanty and remotely branched upwards; branchlets filiform and straight, scabrous, with 1-3 spikelets at the tips; pedicels long, adpressed, the lateral ones usually very much shorter than the glumes, scabrous. *Spikelets* pallid to purplish in colour. *Glumes* unequal, the lower exceeding the upper in length, 1-nerved, linear-lanceolate, mucronate or shortly awned; the lower smooth with a somewhat scabrous keel upwards, up to 11 mm. long; the upper smooth, at times slightly emarginate, up to 9 mm. long. *Lemma* tubulous, not beaked, usually somewhat shorter than the glumes, about up to 8 mm. long, smooth and punctulate above only; *callus* shortly bearded; awns subequal or the central slightly longer, scabrous, 7-13 mm. long, divergent.

CAPE PROVINCE.

Somerset East distr.: Somerset East, *Bowker* 166 (K). Fort Beaufort distr.: Kanyabie, *Drège* 3878 (B, BM, G, K, N, O, P, S, V). Kingwilliamstown distr.: Kingwilliamstown, XII. 1894, *Schlechter* 6126 (A, B, BM, G, K, N, V, Z); do., *Sim* 31 (Z). East London distr.: East London, III. 1933, *Langenegger* s.n. (N). Komgha distr.: Komgha, *Flanagan* 1775 (A, BH, N). Queenstown distr.: Queenstown, *Everett* 58 (N); do., II. 1899, *Galpin* 2578 (A, K, N).

NATAL PROVINCE.

Pietermaritzburg distr.: Near Pietermaritzburg, XII. 1898, *Medley Wood* 7232 (K). Inanda distr.: Verulam, VII. 1893, *Schlechter* (A, B, BH, BM, G, K, N, V, Z). Estcourt distr.: Winterton, I. 1933, *King* 385 (N). Klip River, *Rehmann* 7102 (BM, K, N, V, Z). Without precise locality: XII. 1898, *Medley Wood* 7358 (D, K). Zululand, Mtunzini distr.: V. 1919, *Mogg* H. 20043 (N, W) and XI. 1919, *Mogg* 5921 (N).

BASUTOLAND.

Mohale's Hoek distr.: Maphutseng, I. 1916, *Dieterlen* 1208 (N, K, P, S). Leribe distr.: Leribe, II. 1877, *Buchanan* 125 (K).

ORANGE FREE STATE.

Bloemfontein distr.: Bloemfontein, *Rehmann* 3736 (B, BM, K, V, Z); Senekal distr.: Doornkop, XII. 1931, *Goossens* 930 (B, K, N, W). Bethlehem distr.: Bethlehem, I. 1932, *Goossens* 1123 (N). Kroonstad distr.: Kroonstad, *Pont* 100 (Z); do., II. 1928, *Pont* 5 (N); do., *Chennells* 86 (BH). Heilbron distr.: Maccauvlei, X. 1924, *Brandmuller* 108 (N). Without precise locality: *Buchanan* 63 (BH); *Burke* 430 (K, S, Z); *Burke and Zeyher* 1810 (O, V); *Zeyher* 1810 (BM, K, N).

TRANSVAAL PROVINCE.

Vereeniging distr.: Vereeniging, XII. 1935, *Story* 11 (N). Heidelberg distr.: Uitgevalen, XII. 1909, *Burt Davy* 9125 (N). Wakkerstroom distr.: Amersfoort, III. 1917, *Burt Davy* 17349 (K, N). Johannesburg distr.: Johannesburg, *English* 21788 (BH). Pretoria distr.: Pretoria, II. 1924, *Dickson* 17 (N); do., IV. 1933, *Smith* 6553 (N); do., *Appleton* 91 (K); do., II. 1936, *Mogg* 13727 (N); do., XII. 1933, *Barrie* in Hb. Stell 19669 (St). Lydenburg distr.: Waterval Boven, IV. 1904, *Burt Davy* 1443 b (N). Middelburg distr.: Klein Olifants Rivier, XI. 1893, *Schlechter* 3820 (A, B, BM, D, G, K, N, T, V, Z). Potchefstroom distr.: Klerksdorp, III. 1932, *Moses* 9 (N).

TYPE SPECIMEN.

Drège 3878 is deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAMES.

Krulgras. Steekgras.

ECONOMIC NOTES.

This species is readily eaten by stock.

32. **A. scabrivalvis** Hack. in Bull. Herb. Boiss. Ser. 2. **6**. 708 (1906); Dinter in Fedde, Rep. **15**. 343 (1918); Stent in Bothalia **1**. IV. 277 (1924); Henrard Crit. Rev. **3**. 534 (1928); Henrard Monogr. **2**. 202 cum ic. tab. 91 (1932).

Annual, slender, erect or somewhat ascending, including the inflorescence up to 85 cm. high, often very much smaller, usually branched from or very near the base. *Culms* elegant, slender, branched from nearly all nodes, about 3–4-noded; nodes usually conspicuous, glabrous; internodes glabrous, up to 12 cm. long, exserted, more or less terete. *Leaf-sheaths* lax, the lower slipping from the culms, keeled, striate, minutely scaberulous or glabrous; *ligules* densely and shortly ciliate; auricles densely ciliate or glabrous; collar glabrous; *blades* linear, gradually narrowed, up to 30 cm. long and 3.5 mm. wide, often much shorter and narrower, rigid or somewhat flaccid, glabrous beneath, scaberulous and hirtellous on the upper surface, margins scabrous and thickened. *Panicles* terminal and lateral, lax and open, up to 30 cm. or more long, often very much shorter and smaller, ovate in outline. Axis smooth or very minutely scaberulous; branches filiform, straight or somewhat flexuous, scaberulous, solitary or binate, elongate, the lower sometimes more than half as long as the panicle, naked in their lower part, the spikelets more or less scattered or at times congested towards the ends of the branches; pedicels scaberulous, longer to

shorter than the glumes. *Spikelets* usually purple or purplish-brown in colour. *Glumes* linear-lanceolate, acute, prominently awned, slightly unequal to unequal, scaberulous, with a very markedly scabrous keel; the lower up to 9 mm. long, including the awn but often much shorter, awn 2.5 mm. long arising from the slightly bifid apex of the glume; the upper also up to 9 mm. long including the 1.5 mm. long awn, lateral setae well-developed. *Lemma* linear, tubular or somewhat compressed and keeled, about 7–8 mm. long, often much shorter, usually aculeolate-scabrous except near the base but always markedly scabrous on the keel, purplish to greenish in colour and usually mottled, somewhat narrowed towards the apex; *callus* \pm 0.5 mm., rounded, densely bearded; awns up to 14 mm. long, scabrous, erect or spreading, the lateral slightly shorter than the central.

SOUTH WEST AFRICA.

Otavi, II. 1925, *Dinter* 5752 (BH, G, GU, N, S, Z); Otjenga, III. 1939, *Volk* 1396b (D); Ossa, III. 1939, *Volk* 1538 (D) et 1539 (D); Otjiputo, II. 1939, *Volk* 1239 (D).

CAPE PROVINCE.

Barkly West distr.: Newlands, III. 1934, *Paton* 3158 (K, Mc); Shalen, II. 1937, *Acock* 1859 (Mc); near Spitzkop, II. 1937, *Acock* 1809 (K, Mc).

TRANSVAAL PROVINCE.

Potchefstroom distr.: Oudeplaats, IV. 1937, *Bunting* 157 (N). Vereeniging distr.: Vereeniging, I. 1915, *Burt Davy* 15175 (BH) et III. 1917, *Burt Davy* 17214 (N). Boksburg distr.: Vogelfontein, V. 1918, *Rogers* 22675 (Z). Johannesburg distr.: Frankenwald, I. 1933, *Frankenwald Herb.* 229 (WR). Pretoria distr.: Pretoria, II. 1924, *Dickson* 15 (N); do., III. 1925, *McClean* 11 (N); do., III. 1914, *Mogg* 10432 (N); do., I. 1926, *Smith* 2264 (N); do., VI. 1912, *Theiler* 12015 (T); do., IV. 1932, *Smith* 6198 (K); do., II. 1939, *Schweickerdt* 1925 (B, K, N, W); Pienaars River, I. 1894, *Schlechter* 4217 (A, BM, G, K, N, P, T, V, Z); do., I. 1926, *Smith* 2170a (N); Saltpan, II. 1937, *Bunting* 76 (N) et 80 (N); do., III. 1937, *Bunting* 117 (N). Waterberg distr.: Warmbaths, I. 1936, *Irvine* 20 (N); Naboomspruit, I. 1919, *Galpin* 427 (N, W) et III. 1923, *Galpin* 566 (N); Potgietersrust, II. 1921, *Galpin* 8891 (K, N, W); Makapan's Poort, III. 1894, *Schlechter* 4689 (A, BH, BM, G, K, N, T, V, W, Z); Crecy, *Carver* 12 (N). Pietersburg distr.: Sand Rivier, III. 1895, *Schlechter* 6909 (A, BH, G, K, N, V, Z); Tzaneen, *Sampson* H. 4429 (N). Zoutpansberg distr.: Mara, II. 1935, *de Klerk* 10 (N).

BECHUANALAND PROTECTORATE.

Francistown, IV. 1929, *Gordon* 55 (N); Mahalapye, IV. 1931, *Pole Evans* 3205 (K, N).

TYPE SPECIMEN.

The Syn-types *Schlechter* 4217 et 4689 are deposited in the Botanisches Museum, Zürich.

33. *A. effusa* Henrard Crit. Rev. **1**. 155 (1926); Henrard Monogr. **2**. 204 cum ic. tab. 92 (1932).

A. Waibeliana Henrard Crit. Rev. **3**. 679 (1928); Henrard Monogr. **2**. 204 cum ic. tab. 92 (1932).

Annual, slender, erect, including the inflorescence up to 90 cm. high (2–3 ft. fide Barnard!). *Culms* elegant, branched from nearly all nodes, about 3–4-noded; nodes conspicuous, glabrous, somewhat swollen; internodes glabrous, up to 15 cm. long, exserted, more or less terete. *Leaf-sheaths* lax, the lower slipping from the stems, keeled, striate, minutely scaberulous; *ligules* densely and shortly ciliate; auricles glabrous to densely ciliate; collar smooth; *blades* linear, gradually narrowed, up to 30 cm. long and up to 3 mm. wide, glabrous or minutely scaberulous on the lower surface, more or less scaberulous and hirtellous on the upper surface, striate, margins thickened. *Panicles* terminal and lateral, very diffuse and open; the terminal 20–30 cm. long or shorter, about 15 cm. wide;

the lateral panicles usually much shorter; axis glabrous; branches solitary or binate, elongate, subcapillary, scaberulous, straight or flexuous, naked in their lower part. *Spikelets* more or less congested towards the end of the branches; pedicels long or somewhat short, scaberulous. *Glumes* about equal or slightly unequal; lower glume lanceolate, purplish, about up to 8.5 mm. long, acute or with an inconspicuous mucro, glabrous in the lower part, scaberulous towards the apex, keel very scabrous especially upwards, 1-nerved; the upper about up to 8 mm. long, purplish or not so, linear lanceolate, of a thinner and more papery texture than the lower glume, truncate or very obtuse at the apex, glabrous, 1-nerved, keel glabrous and smooth. *Lemma* narrowly linear, up to 11.5 mm. long but often very much shorter, tubulous or compressed, hardly narrowed above, pallid or brown, at times mottled, extremely scabrous on the keel upwards and more or less so over the surface in the upper two-thirds; apex of *callus* rounded, obtuse, conspicuous; awns erect straight, or somewhat spreading, scabrous; the central awn about 16 mm. long, the lateral shorter and up to 13 mm. long.

SOUTHERN ANGOLA.

Between Gambos Fort and Mission Station, V. 1909, *Pearson* 2445 (K, N).

SOUTH WEST AFRICA.

Kunene River Banks, *Barnard* 41 (N, S); Grootfontein, II. 1933, *Schoenfelder* 99 (K, N); Otjiwarongo, III. 1928, *Bradfield* 378 (N); Waterberg, V. 1928, *Bradfield* 378 (A, N); Oweipütz, V. 1886, *Marloth* 1379 (N, W); Karibib, IV. 1913, *Engler* 6162 (B); Tsumebpad, IV. 1939, *Volk* 1672 (D); Ozondjache, XII. 1938, *Volk* 538 (D); Asis, III. 1939, *Volk* 770 (D).

TYPE SPECIMEN.

Engler 6162 is deposited in the Botanisches Museum, Berlin-Dahlem.

34. *A. canescens* *Henrard* Crit. Rev. Supplem. 708 (1933); *Henrard* Monogr. 2. 210 et 309 et cum ic. tab. 95 (1932).

A. junciformis Trin. et Rupr. sec. Stent in *Bothalia* 1. IV. 277 (1924) pro parte, non Trin. et Rupr.

Perennial, densely caespitose, with several innovations. *Culms* erect, elegant, simple (very rarely branched), up to 1 m. high, about 4-noded; internodes terete, striate, glabrous or slightly scaberulous below the nodes, exserted; nodes glabrous. *Leaf-sheaths* shorter than the internodes, tight, striate, glabrous or scaberulous, the lower somewhat compressed; *ligule* a ciliolate rim; auricles pubescent, at times bearded with long hairs; collar minutely pubescent; *blades* narrow, linear, coarse, 20 cm. long or much longer, involute, flat only near the base, in robust specimens up to 2-2.5 mm. wide, glabrous or scaberulous on the lower surface, scaberulous on the upper surface, margins thickened and scabrid. *Panicle* erect, lax or contracted but often interrupted and then the spikelets congested, up to 20 cm. long; rhachis striate, angular, scabrous; branches somewhat remote, binate or ternate, or solitary upwards, naked at the base over some distance or in some cases shortly peduncled and spikelets densely congested; pedicels short, scaberulous. *Spikelets* erect, pallid or yellowish-green, or tinged with purple. *Glumes* unequal, 1-nerved; the lower 5.5-8 mm. long, laterally compressed, keeled, scaberulous on the keel and minutely so on the flanks, emarginate at the apex or sometimes with a short mucro from the bilobed apex; the upper 8-11 mm. long, truncate at the apex or shortly mucronate from a subbifid apex; smooth on flanks and keel. *Lemma* 7-11 mm. long, somewhat laterally compressed, smooth or sometimes scaberulous on the keel, narrowed upwards but not forming a column; *callus* \pm 1 mm. long, obtuse, densely or shortly bearded; awns flattened, scabrous, erect or slightly spreading, subequal, the central 9-15 mm. long, the lateral 7-13 mm. long.

CAPE PROVINCE.

Vryburg distr.: Vryburg, Armoedsvlakte, III. 1920, *Theiler* H. 20182 (N) et H. 20240 (N). Taungs distr.: Dryharts, I. 1923, *Henrici* 39 (N).

ORANGE FREE STATE.

Bloemfontein distr.: Bloemfontein, III. 1917, *Potts* 2407 (K, N, W) et 2894 (K); Glen, III. 1926, *Agricult. School* 3447 (N). Kroonstad distr.: Vals Rivier, II. 1929, *Pont* 149 (GU, N, Z). Heilbron distr.: Heilbron, I. 1931, *Goossens* 425a (GU, N, W) et 566 (GU, N, W). Vredefort distr.: Reitzburg, II. 1937, *Bunting* 113 (N); Schoemans drift, II. 1937, *Bunting* 108 (N).

TRANSCAAL PROVINCE.

Bloemhof distr.: Christiana, III. 1912, *Burt Davy* 13057 (N); Kameelpan, I. 1934, *Theron* 548 (N) et 550 (N). Wolmaransstad distr.: Wolmaransstad, *Cronje* 7643 (K, N). Potchefstroom distr.: Ventersdorp, III. 1931, *Pole Evans* 3143 (B, N); Machavie, III. 1927, *Lane* 9 et 9b et 14 et 18 (omnes N); Klerksdorp, IV. 1937, *Rose Innes* 964 (N) et 965 (N); Rhenosterfontein, IV. 1937, *Rose Innes* 966 (N). Vereeniging distr.: Leeuwkuil, *Bunting* 136 (N). Krugersdorp distr.: Hekpoort, IV. 1936, *Bunting* 44 (N) et 30 (N) et VIII. 1936, *Bunting* 47 (N). Pretoria distr.: Pretoria, II. 1933, *Phillips* 3625 (N); do., XII. 1933, *Barrie* in Hb. Stell. 19671 (St). Waterberg distr.: Warmbaths, II. 1921, *Stent* H. 21573 (N, W); do., I. 1936, *Irvine* 15 (N); Nylstroom, IV. 1927, *Straker* 11 (K, N); Naboomspruit, III. 1919, *Galpin* M. 426 (N).

TYPE SPECIMEN.

Cronje 7643 is deposited in The Herbarium, Royal Bot. Gardens, Kew.

COMMON NAMES.

Steekgras(s).

ECONOMIC NOTES.

This species is very wiry and thus unpalatable.

35. **A. monticola** *Henrard* Crit. Rev. 2. 355 (1927); *Henrard Monogr.* 2. 220 cum ic. tab. 101 (1932).

Perennial, usually caespitose, but sometimes assuming an almost creeping habit, rooting at the lowermost nodes. *Culms* erect or geniculately ascending, including the panicle up to 80 cm. high, many-noded, usually giving rise to branches at the nodes; internodes elegant, terete, wiry, scarcely 1 mm. thick, glabrous, striate, exserted. *Leaf-sheaths* short or about one half the length of the internodes, terete, tight, glabrous and striate. *Ligule* a thickened shortly ciliolate rim; auricles long-bearded; collar glabrous; *blades* narrow linear, flat or convolute at the base, glaucous, up to 12 cm. long and 2 mm. wide, glabrous on the lower surface, upper surface scaberulous and at times with some scattered long hairs, margins markedly thickened, acute, curved or flexuous. *Panicle* erect, lanceolate in outline, up to 14 cm. long; rhachis scaberulous and striate; branches usually binate, scaberulous, striate, ascending or almost adpressed; pedicels longer or shorter than the glumes. *Spikelets* erect, dull purplish-brown. *Glumes* linear-lanceolate, 1-nerved; the lower 6-8.5 mm. long, shortly awned, glabrous except for the scabrous keel; the upper glabrous, 5-6 mm. long, bidentate at the apex with a very short mucro from the sinus. *Lemma* tubulous, purple, smooth, 6-6.5 mm. long, produced into a distinctly twisted short scabrous column; *callus* very short, rounded, obtuse, long-bearded; awns unequal, sub-erect or divergent, the central up to 18 mm. long, the lateral branches up to 13 mm. long.

NATAL PROVINCE.

Ipolela distr.: Underberg, III. 1938, *McClellan* 683 (N). Bergville distr.: Mt. Aux Sources, IV. 1919, *Mogg* 5282 (N) et H. 20634 (K, N); do., II. 1926, *Bayer et McClellan* 154 (K, N) et 157 (K, N). Champagne Castle, X. 1933, *Meebold* NH. 15728 (N).

TYPE SPECIMEN.

Mogg H. 20634 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

ECONOMIC NOTES.

This species has a very restricted geographic distribution. It has so far only been recorded from the Drakensberg area in Natal. The plants often form a dense tangle along the banks of streams and are also commonly met with in the more open parts of the bush along the mountain gulleys.

36. *A. junciformis* Trin. et Rupr. Spec. Gram. Stip. 143 (1842); Walp. Ann. Bot. **3**. 745 (1852); Steud. Syn. Pl. Glum. **1**. 140 (1854); Dur. et Schinz, Consp. **5**. 804 (1894); Stapf in Dyer, Fl. Cap. **7**. 556 (1899); Stent in Bothalia **1**. IV. 277 (1924) pro parte; Henrard Crit. Rev. **2**. 273 (1927); Henrard Monogr. **2**. 287 cum ic. tab. 140 (1932); Obermeijer, Schweickerdt et Verdoorn in Bothalia **3**. II. 227 (1937).

A. Adscensionis Linn. sec. Phillips in Ann. S. Afr. Mus. **16**. 346 (1917) pro parte, non Linn. *A. angustata* Stapf in Dyer, Fl. Cap. **7**. 556 (1899); Phillips in Ann. S. Afr. Mus. **16**. 346 (1917); Henrard Crit. Rev. **1**. 26 (1926). *A. Burkei* Stapf sec. Phillips in Ann. S. Afr. Mus. **16**. 347 (1917) pro parte, non Stapf. *A. Welwitschii* Rendle, Cat. Afr. Pl. Welw. **2**. I. 202 (1899); Henrard Crit. Rev. **3**. 682 (1928); Henrard Monogr. **2**. 228 cum ic. tab. 107 (1932); Theron in Fedde, Rep. **40**. 21 (1936) [*sphalm. Welwitschia*].

Perennial, loosely to densely caespitose. *Culms* fascicled, erect, simple or scantily branched, wiry, 3-4-noded, up to 60 cm. high; internodes exserted, glabrous, compressed below the nodes; nodes slightly swollen, glabrous. *Leaf-sheaths* tight, the lower often keeled, glabrous or woolly, at times slipping from the internodes; *ligule* a short ciliate rim; auricles bearded or even glabrous; collar glabrous; *blades* very narrow, gradually passing into the sheaths, subsetaceous, convolute or folded below, fairly rigid or curved or flexuous, up to 30 cm. long and 1 mm. wide, smooth on the lower surface, scaberulous to densely pubescent above. *Panicle* narrow, up to 20 cm. long and 1-3 cm. broad, erect or somewhat nodding, rhachis straight or flexuous, angular; branches solitary, up to 5 cm. long, usually scantily branched from the base; branchlets scaberulous; pedicels short or almost 0. *Spikelets* purplish to green or pallid, 7-11 mm. long, congested at the tips of the branches. *Glumes* unequal, linear-lanceolate, thin, glabrous or minutely pubescent, subacute to acute and awned; the lower 4-9 mm. long, scabrous dorsally and on the keel; the upper 8-12 mm. long, awned. *Lemma* linear, tubular, up to 9 mm. long including the column, smooth or scaberulous below the column; *callus* about 0.5 mm. long, obtuse; column of awns present and well-developed or almost 0; central awn 12-35 mm. long; lateral awns 9-28 mm. long.

SOUTH WEST AFRICA.

Otjijongombe, II. 1939, *Volk* 1175 (D); Okavango river, anno 1939, *Volk* 2146 (D).

CAPE PROVINCE.

Ceres distr.: Koudebokkeveld, Schurffeberg, I. 1897, *Schlechter* 10184 (A, B, BH, BM, G, N, P, T, W, Z); Matroosberg, I. 1917, *Phillips* 2108 (S). Tulbagh distr.: Tulbagh, II. 1896, *Schlechter* 7509 (A, B, BH, BM, K, P, T, V, W, Z). Worcester distr.: Worcester, *Rehmann* 2582 (BM, Z) et 2587 (K, BM, Z) et 2667 (K, BM, Z). Paarl distr.: Bainskloof, II. 1897, *Schlechter* 10258 (A, B, BH, BM, G, N, P, V, W, Z); do., IV. 1915, *Bolus* 14742 (BH, Z). Stellenbosch distr.: Stellenbosch, anno 1925, *Duthie* 1658 et 1658a (Sreg); do., anno 1926, *Duthie* in Hb. Stell. 1476 (Sreg). Cape distr.: Cape Peninsula, II. 1897, *Wolley-Dod* 2387 (BH, BM) et 2388 (BH, BM); do., *Hitchcock* 24059 (K, N, W); do., *Bolus* 14703 (A, BH, K, N, T, Z) et 21785 (BH); do., VIII. 1936, *Acock* 679 (Mc); do., IV. 1936, *Adamson* 897 (U); do., III. 1922, *Pole Evans* 492 (N). Caledon distr.: Palmiet Rivier, II. 1932, *Levy* 3841 (U); Rivierzondereinde, I. 1896, *Schlechter* 9896 (A, B, BH, BM, G, N, P, T, V, W, Z). Swellendam distr.: Grootvaderbosch, *Marloth* 3706 (B, N); Buffeljagtrivier, I. 1893, *Schlechter* 2073 (A, B, BM, G, K, P, V, Z); Zuurbraak, I. 1893, *Schlechter* 2121 (A, B, BH, BM, G, K, P, V, Z). Riversdale distr.: Riversdale, IV. 1926, *Muir* 3616 (N) et 3910 (N). George distr.: George, III. 1893, *Schlechter* 2403 (A, B, BH, BM, G, K, P, V, Z); do., VIII. 1935, *Baker* 19 (N). Humansdorp distr.: Between

Essenbosch and Two Streams, V. 1923, *Fourcade* 2543 (K, N). Uitenhage distr. : Thornhill, III. 1911, *Pillans* 1788 (K, N). Port Elizabeth distr. : Port Elizabeth, V. 1902, *Galpin* 6385 (A, N). Albany distr. : Albany, *Bowie* 23 (BM). East London distr. : Near East London, III. 1890, *Sim* 29 (Z). Kingwilliamstown distr. : Kei Road, II. 1928, *Ranger* 51 (N); *Perie*, XI. 1901, *Sim* 2835 (A, BM). Cathcart distr. : Windvogelsberg, *Baur* 1115 (A, K). Queenstown distr. : Sterkstroom, XI. 1901, *Sim* 2734 (A) et 2735 (A). Komgha distr. : Komgha, III. 1893, *Flanagan* 1777 (A, BH, N) et II. 1894, *Flanagan* 2218 (A, N). Kentani distr. : Kentani, *Pegler* 238 (A, BH, N). Engcobo distr. : Near Engcobo, I. 1896, *Flanagan* 2799 (BH, K, N). Lusikisiki distr. : Port St. Johns, IV. 1899, *Galpin* 2875 (A, K, N). Maclear distr. : Maclear, III. 1904, *Galpin* 6901 (A, B, BH, D, K, N, S); do., I. 1923, *Brütten* 4542 (A) et 4607 (A). Without precise locality : *Carmichael* s.n. (BM); Pondoland, *Bachmann* 168 (B) et 169 (B) et 170 (B).

NATAL PROVINCE.

Richmond distr. : Richmond, III. 1934, *Lynes* 650a (BM). Durban distr. : Port Natal, *Drège* (B, LG, N, V); Durban, *Williamson* 34 (K); do., *Kuntze* s.n. (K); do., *Plant* 61 (BM, K, O, P, V); do., *Grant* s.n. (K); do., *Schweickerdt* 1349 et 1351-1353 (B, D, K, L, P, V, W, Z). Inanda distr. : Inanda, *Rehmann* 8251 (V, Z). Camperdown distr. : Varkkop (Vaalkop?), *Rehmann* 7665 (A, BH, BM, V, Z). Pietermaritzburg distr. : Pietermaritzburg, III. 1926, *McClellan* 198 (K, W); do., Fort Napier, *Steinbart* s.n. (B). Lions River distr. : Karkloof, IV. 1896, *Wylie* 7691 (D); Balgowan, IV. 1919, *Mogg* 3877 (N) et 3878 (N). Lidgetton, IV. 1917, *Mogg* 544 (N). Estcourt distr. : Mooi River, V. 1917, *Mogg* 126 (N) et III. 1920, *Mogg* 7249 (N); do., XII. 1928, *Mason* 4 (D, K); do., *Rehmann* 7342 (B, BM, K, Z); Giant's Castle, XII. 1914, *Symons* 279 (T). Bergville distr. : Mt. Aux Sources, IV. 1919, *Mogg* 5310 (N); do., II. 1926, *Bayer et McClellan* 219 (K, N). Dundee distr. : Near Dundee, *Medley Wood* 7449 (K). Newcastle distr. : Mount Prospect, *Bunting* 177 et 181 (N). Zululand : Entonjaneni distr. : Melmoth, V. 1919, *Mogg* H. 20041 (N, W). Lower Umfolozi distr. : Mtunzini, V. 1919, *Mogg* H. 20040 (N). Without precise locality : *Hutton* 327 (A, V); *Buchanan* 1 (K); *Sutherland* s.n. (K); *Plant* 11 (G); *Jenkinson* 64 (D, K).

BASUTOLAND.

Leribe distr. : Leribe, *Dieterlen* 199b (K, N, P, V, W); do., II. 1913, *Phillips* 638 (K, S) et 692 (S) et 734 (S) et 741 (S) et 790 (S) et 919 (S).

ORANGE FREE STATE.

Senekal distr. : Doornkop, XII. 1931, *Goossens* 889 (B, K, N, W); Wonderkop, XII. 1931, *Goossens* 834 (K, N) et 841 (K, N). Bethlehem distr. : Bethlehem, II. 1919, *Potts* 4517 (GU, N); do., *Richardson* s.n. (B, K, P, V, W, Z). Kroonstad distr. : Bothaville, I. 1933, *Goossens* 1179 (B, N). Heilbron distr. : Viljoensdrift, I. 1912, *Rogers* 4824 (A, K, T). Vrede distr. : Vrede, V. 1937, *Bunting* 185 (N). Without precise locality : *Buchanan* 55 (D) et 64 (D) et 67 (BH, D, K) et 289 (D, K).

TRANSVAAL PROVINCE.

Wakkerstroom distr. : Amersfoort, III. 1917, *Burt Davy* 17362 (K). Ermelo distr. : Ermelo, III. 1917, *Burt Davy* 17426 (W) et 17467 (K); do., II. 1910, *Burt Davy* 9267 (N) et 9320 (N) et I. 1904, *Burt Davy* 950 (N); do., XII. 1926, *Henrici* 1217 (N); do., I. 1936, *Norval* 102 (N); Lake Chrissie, III. 1904, *Hamilton* H. 994 (N) et IV. 1910, *Hamilton* 5913 (N). Standerton distr. : Standerton, V. 1937, *Bunting* 123 (N). Heidelberg distr. : Henley-on-Klip, II. 1922, *Stent* H. 21135 (N); Uitgevalen, XII. 1909, *Burt Davy* 9185 (N). Vereeniging distr. : Vereeniging, II. 1917, *Burt Davy* 17093 (BH, K) et III. 1917, *Burt Davy* 17206 (BH, K). Leeuwkuil, XII. 1935, *Story* 5 (N). Johannesburg distr. : Johannesburg, XI. 1902, *Rand* 1044 (BM); Frankenwald, I. 1937, *Bunting* 90 (N). Pretoria distr. : Pretoria, XII. 1917, *Burt Davy* 7494 (N); Koedoespoort, *Rehmann* 4640 (B, V); do., XI. 1915, *Mogg* 11798 (N). Zilikaatsnek, IV. 1918, *Pole Evans* H. 17587

(N); Irene, I. 1922, *Pole Evans* 359 (N). Rustenburg distr.: Holfontein, *Nelson* 79 (K). Waterberg distr.: Elandspruitbergen, XII. 1893, *Schlechter* 3998 (A, B, BH, BM, G, K, T, V, Z); Warmbaths, II. 1921, *Stent* H. 21450 (N); Naboomspruit, IV. 1924, *Galpin* H. 712 (N) et II. 1919, *Galpin* M. 423 (K, N); Pietpotgietersrust, III. 1921, *Galpin* 8889 (K); Pongola River, XII. 1919, *Burt Davy* 18264 (K). Pietersburg distr.: Houtbosch, *Rehmann* 5665 (Z) et 6567 (K, V, Z). Zoutpansberg distr.: Zoutpan, IV. 1934, *Schweickerdt et Verdoorn* 572 (N, B).

BECHUANALAND PROTECTORATE.

Kanye, III. 1937, *Bunting* 132 (N).

TYPE SPECIMEN.

Drège (Port Natal?) is deposited in the Trinius Herbarium, Leningrad.

COMMON NAMES.

Heigras. Koperdraat. Wire-grass.

ECONOMIC NOTES.

This species is tough and wiry and thus from a forage point of view, useless.

REMARKS.

The spikelets of this species show a great deal of variation. One and the same specimen (*Flanagan* 2218) shows the following ranges: Lower glume 7-9 mm., upper glume 8-12 mm., lemma 6-9 mm., central awn 12-34 mm., and lateral awns 9-28 mm. long. The length of the column likewise is extremely variable. *Galpin* 6901 shows the presence of spikelets in which the column is well-developed and exerted beyond the glumes, whereas in others of the same gathering the column is only weakly developed and thus not exerted beyond the glumes.

From the foregoing synonymy it is evident that I do not consider *A. angustata* Stapf to be specifically distinct from *A. junciiformis*. The reason is that *Wolley-Dod* 2387 and *Rehmann* 2582, syn-lectotypes of Henrard, have culms which are distinctly compressed below the nodes, furthermore the lemmas are not always exerted beyond the shortly mucronate glumes. The most important characters of distinction thus break down.

Examination of Rendle's types of *A. Welwitschii* in the British Museum have also revealed the presence of culms which are compressed below the nodes. This also holds good for the *var. minor* of Rendle. These specimens are not distinguishable from *A. junciiformis* on the character just mentioned.

Since Henrard considers *A. Welwitschii* to be synonymous with *A. angustata* and on which point I fully agree, I have not been able to arrive at a view other than that expressed in the synonymy cited above for this species.

37. *A. transvaalensis* Henrard Crit. Rev. Suppl. 742 (1933); Henrard Monogr. 2. 235 cum ic. tab. 111 (1932).

Densely caespitose perennial. Culms erect, simple below, branched from most of the nodes, more rarely simple, erect, elegant, few to many-noded, including the panicles up to 70 cm. high; internodes glaucous, striate, terete, smooth or very minutely scaberulous, exerted from the leaf sheaths, lowermost internode usually long (up to 30 cm. !); nodes inconspicuous, glabrous. Basal leaves pallid, slipping from the stems; lower sheaths striate, somewhat compressed or subterete, glabrous, with somewhat hyaline margins; the upper sheaths lax and slipping from the internodes or fairly tight and not slipping from the internodes; ligule minute and shortly ciliolate; auricles minutely bearded; collar glabrous; the basal blades soon dying off, linear, acute, recurved or flexuous, striate, lower surface glabrous, scabrous on the upper surface, convolute; the upper narrow convolute about 1 mm. wide (when opened out), setaceous, acute, flexuous or somewhat curved,

up to 15 cm. long, striate, glabrous beneath, scaberulous and with prominently thickened marginal veins above, margins minutely serrate. *Panicle* narrow, somewhat lax, up to 8 cm. long, scarcely or well-exserted; axis more or less terete or subangular, scaberulous or smooth; branches solitary, bipartite from the base, up to 2.5 cm. long, erect and adpressed, bearing spikelets to the base or shortly peduncled and with erect branchlets; pedicels scabrous. *Spikelets* congested, shortly pedicelled, pallid or dull-purplish or greenish, small, erect. *Glumes* lanceolate, unequal, 1-nerved, acute; the lower 5–9 mm. long, shortly awned, upwards scabrous on the keel; the upper 6.5–10 mm. long, minutely subtruncate at the apex and awned, glabrous on the keel. *Lemma* smooth, minutely granular upwards, tubulous, together with the column up to 11.5 mm. long, narrowed above and stipitate or with a well-developed column; *callus* very short (0.3 mm.), very obtuse, almost truncate, densely hairy; column 1–5.5 mm. long, scabrous, twisted; awns unequal, scabrous; the central divergent (almost geniculately so) and 6–13 mm. long; the lateral at times absent, more usually present and up to 8 mm. long.

NATAL PROVINCE.

Newcastle distr.: Mount Prospect, V. 1937, *Bunting* 177 (N).

TRANSVAAL PROVINCE.

Potchefstroom distr.: Klerksdorp, XI. 1937, *Bunting* 158 (N). Krugersdorp distr.: Krugersdorp, II. 1937, *Bunting* 139 (N) et 141 (N). Johannesburg distr.: Johannesburg, III. 1920, *Burt Davy* 18880 (K, N); do., V. 1915, *Burt Davy* 15255 (BH, N); do., VII. 1929, *Hitchcock* 24116 (K, N, W); do., I. 1919, *Bryant* A. 25 (N, W); do., IV. 1927, *Moss* 14258 (WR); do., I. 1922, *Moss* 6337 (WR); do., III. 1920, *Moss* 3575 (K, WR, W); Frankenswald, II. 1937, *Bunting* 95 et 97 et 164 et 188 (omnes N). Pretoria distr.: Pretoria, IX. 1905, *Engler* 2761 (B); Wonderboom, IV. 1932, *Smith* 6113 (N) et 6198 (K, N); do., II. 1933, *Phillips* 3524 (N). Koedoespoort, *Rehmann* 4620 (Z); do., II. 1939, *Schweickerdt* 1327 et 1331 et 1332 (omnes B, K, N, W); Baviaanspoort, IV. 1927, *Moss* 14259 (K, N, WR). Barberton distr.: Barberton, V. 1930, *Thorncroft* 21 (B, K, N).

BECHUANALAND PROTECTORATE.

Kanye, III. 1937, *Bunting* 132 (N).

TYPE SPECIMEN.

Moss 14259 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

ECONOMIC NOTES.

Owing to the wiry nature of the culms and the scantiness of leaf, this species most probably is unpalatable.

REMARKS.

In this species the lateral awns are not always well-developed. *Thorncroft* 21 has several inflorescences in which they are absent or merely weakly developed, so that the spikelets superficially resemble those of *Stipa parvula* Nees. The same gathering also shows inflorescences with lemmas in which the lateral awns are well-developed, thus proving that the length of the lateral awns is extremely variable. The length of the column of the awns is likewise extremely variable even in one and the same individual.

This species grows in close proximity to *A. aequisilum* Hack. but may be distinguished from this by the comparatively more-contracted inflorescence and smaller spikelets. The branching of the culms is not a critical character since it also occurs in *A. aequisilum* though far less frequently so. *A. transvaalensis* is very commonly met with on the northern slopes of the Magaliesberg where it grows in the crevices on quartzite and forms dense tussocks.

38. *A. aequiglumis* Hack. in Bull. Herb. Boiss. 3. 381 (1895); Stapf in Dyer, Fl. Cap. 7. 555 (1899); Henrard Crit. Rev. 1. 18 (1926); Henrard Monogr. 2. 236 cum ic. tab. 112 (1932); Theron in Fedde, Rep. 40. 21 (1936).

Perennial, densely caespitose, up to 70 cm. high, but usually much smaller. *Culms* slender, simple, erect, terete, 3-4-noded, rarely branched from the nodes; internodes glabrous, striate, exserted. *Leaf-sheaths* persistent, shorter than the internodes, striate glabrous, the lower pallid; *ligule* a minutely ciliolate rim; auricles minutely pubescent, more rarely bearded with a few long white hairs; *blades* setaceous, convolute, rather firm, recurved or flexuous, up to 15 cm. long but often much shorter, finely striate and glabrous on the lower surface, minutely pubescent and striate on the upper surface, margins scabrous. *Panicle* linear-oblong, contracted or lax and open but never spike-like, about 10 cm. long, rarely somewhat longer; rhachis filiform; branches remotely 2-3-nate or the upper solitary, erect and almost adpressed to the rhachis, the longest up to 6 cm. long, usually branched from near the middle and bearing 1-3 spikelets on short scaberulous pedicels. *Glumes* linear-lanceolate, 1-nerved; the lower rather broad at the base, 7-11 mm. long, with a prominent and scabrous or glabrous midrib, acute or shortly mucronate from a minutely 2-lobed apex, dorsally minutely scaberulous to conspicuously scabrid-hairy on the flanks, usually somewhat recurved near the apex; the upper 7-11.5 mm. long, midrib conspicuous and glabrous, scaberulous dorsally and often scabrid-hairy on the flanks, shortly mucronate from a minutely 2-lobed apex, often recurved at the apex. *Lemma* linear-convolute, including the callus and twisted scaberulous column from 8-16 mm. long, dorsally minutely scaberulous upwards; column 2-8 mm. long; awns capillary, suberect or slightly spreading, scaberulous; the central 15-30 mm. long; the lateral awns somewhat shorter, 14-28 mm., long. *Anthers* 4 mm. long, pale yellow to purple. *Stigmas* an intense purple, 2.5 mm. long.

TRANSVAAL PROVINCE.

Potchefstroom distr.: Losberg, XII. 1934, Theron 941 (T); do., IV. 1937, Bunting 166 (N); do., Rhenosterfontein, IV. 1937, Bunting 167 (N). Krugersdorp distr.: Hekpoort, V. 1936, Bunting 68 (N) et III. 1937, Bunting 610 et 148 (N); near Robinson, III. 1928, Moss 16501 (K, WR, W). Johannesburg distr.: Johannesburg, XII. 1908, Leendertz 1823 (T); do., VII. 1929, Hitchcock 24124 (K, N, W); do., II. 1928, Moss 16250 (K, N, WU); do., IV. 1911, Pillans 1814 (K); do., III. 1920, Burt Davy 18907 (K); Frankenwald, II. 1937, Bunting 96 (N) et 99 (N); Witwatersrand, IV. 1895, Hutton 883 (A). Pretoria distr.: Pretoria, Pont 958 (Z) et 1076 (Z); do., IV. 1930, Mogg 8440 (K, N); do., I. 1894, Schlechter 4150 (Z); Koedoespoort, Rehmann 4696 (B, K, N, V, Z); do., II. 1929, Stent et Mogg 8099 (N); do., III. 1939, Schweickerdt 1342-1344 (K, N, B, V, W); Saartjiesnek off Pelindaba Road, II. 1939, Schweickerdt 1328 et 1329 et 1330 (omnes B, K, N, W). Middelburg distr.: Wilge Rivier, I. 1894, Schlechter 4129 (A, BH, BM, K, N, T, V) et 4129a (Z); Balmoral, IV. 1917, Pole Evans H. 11638 (K). Waterberg distr.: Nylstroom, IV. 1932, Skead 30 (N); Naboomspruit, IV. 1924, Galpin M. 713 (N).

TYPE SPECIMEN.

Rehmann 4696 is deposited in the Naturhistorisches Museum, Wien.

REMARKS.

Henrard in his Monogr. 2. 236 states the lower glume to be "glabrous and smooth, minutely pubescent only at the tip". He uses this as a diagnostic character to distinguish between *A. aequiglumis* and *A. huillensis*. Careful examination of Hackel's type has shown that the lower glume is often scaberulous on both the keel and the flanks and also from the base upwards. A drawing made by Stapf of some of the type gathering in Herb. Kew. also shows the glumes to be scaberulous. In the various sheets enumerated above I have found the lower glume to be scaberulous or even shortly hairy dorsally to a greater or lesser degree. Some spikelets may be almost glabrous and smooth (Hutton 883) whereas in the same gathering others again are markedly hairy. It thus appears that the degree

of indumentum of the glumes is of relatively little taxonomic importance. As some specimens of *A. aequiglumis* have branched culms and this is always met with in *A. huillensis*, it is extremely doubtful whether these plants really represent distinct species.

A wide range of material from the type locality and another locality has been collected recently by the author of this paper. These specimens clearly show the range in variation of the species.

39. *A. rhiniochloa* Hochst. in Flora **38**. 200 (1855); Dur. et Schinz, Consp. **5**. 808 (1894) [sphalm. *rhinochloa*]; Dinter in Fedde, Rep. **15**. 342 (1918) [sphalm. *rhinochloa*]; Henrard Crit. Rev. **3**. 510 (1928); Henrard Monogr. **2**. 242 cum ic. tab. 115 (1932); Range in Fedde, Rep. **33**. 9 (1933).

A. rigidiseta Pilger in Engl. Bot. Jahrb. **51**. 413 (1914); Garabedian in Ann. S. Afr. Mus. **16**. II. 404 (1925); Henrard Crit. Rev. **3**. 516 (1928).

Erect annual, branched from the base and not infrequently from the lower and middle nodes. Culms usually erect, very rarely geniculately ascending, 3 to many-noded; internodes, terete, exceeding the lower leaf-sheaths, retrorsely scabrous, striate; nodes minutely pubescent. Lower leaf-sheaths usually slipping off the stem, compressed, keeled, striate, scabrous, the upper likewise but usually exceeding the internodes; ligule long-ciliate; auricles long-bearded; blades flat, up to 20 cm. long and 4 mm. wide, glaucous, many-nerved, very scabrous on both surfaces, acute but not pungent. Panicle effuse or contracted, up to 30 cm. long; axis very scabrous, striate; branches scabrous, the axils densely shortly hairy, binate, more or less peduncled with 1 or 2 few-flowered short branchlets at the base, upper branches shortly peduncled mostly solitary, bearing clustered spikelets on subsessile pedicels or some of them with well-developed pedicels. Spikelets coarse, pallid or purplish-brown, flushed with purple towards the base of the glumes. Glumes broad, very acute, shortly hairy on the back, 1-nerved, keels somewhat scabrous, awned; the lower broadly lanceolate, acuminate, including the awn up to 17 mm. long, but usually about 13 mm. long; the upper broadly-lanceolate, with two lateral teeth at the apex below the awn, up to 15 mm. long or somewhat shorter. Lemma including the densely hairy subobtuse callus up to 13.5 mm. long, usually somewhat shorter (11 mm.), strongly nerved, the nerves with rows of aculeolate antrorsely curved hyaline sharp hairs, keeled dorsally and deeply grooved ventrally with inrolled margins; awns very scabrous, rigid, triquetrous, almost winged at the base, erect or spreading, subequal or the central somewhat longer, 18–30 mm. long or at times up to 40 mm. long.

SOUTH WEST AFRICA.

Otjikwara-Okaharui, III. 1913, Dinter 3292 (B); Otavi, III. 1925, Dinter 5754 (BH, G, GU, N, S, Z); Omuramba und Omatako, III. 1912, Seiner 691 a (41 a) (B); Okahandja, Dinter 1551 (B); do., II. 1928, Bradfield 393 (N) et V. 1928, Bradfield 393 a (K, N), Okahandja-Otjisara, III. 1912, Dinter 2535 (B); Okawaka, I. 1939, Volk 598 (D); Otjiputo; II. 1939, Volk 1251 (D); Otjenga, III. 1939, Volk 1395 (D).

TRANSVAAL PROVINCE.

Waterberg distr.: Crecy, Carver 20 (N) et 24 (N). Zoutpansberg distr.: Messina, X. 1929, Turner 16 (N).

BECHUANALAND PROTECTORATE.

Francistown, IV. 1929, Gordon 66 (N).

TYPE SPECIMEN.

The whereabouts of the actual type, Buchinger 1229 leg. Schimper, is not known, although duplicates of the type are deposited in several herbaria (B, P?).

40. **A. andoniensis** *Henrard* Crit. Rev. 3. 691 (1928); *Henrard Monogr.* 2. 243 (1932).

The habit of this interesting species is not known since it has been described from incomplete material. *Panicle* up to 28 cm. long and 2 cm. wide. *Culms* puberulous and striate below the panicle; rhachis puberulous, striate and angular; branches binate, erect, naked at the base for 1.5–2 cm., axils minutely pubescent; pedicels scabrous, the lateral very short, the terminal up to as long as the glumes. *Spikelets* purple. *Glumes* subequal; the lower 15–16 mm. long, dorsally pubescent, acute, shortly awned; upper glume 14 mm. long, with a 1 mm. long awn from the bifid apex. *Lemma* including the callus up to 12 mm. long, margins inrolled, furrowed ventrally, slightly keeled, glabrous and smooth, minutely scaberulous on the keel; *callus* obtuse, about 1 mm. long; awns erect, triquetrous, winged, very scabrous, up to 30 mm. long.

SOUTH WEST AFRICA.

Andoni, anno 1921, *Barnard* 814 (K, N, S).

TYPE SPECIMEN.

Barnard 814 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

REMARKS.

This species is only known from the above type gathering which consists of rather incomplete material.

41. **A. Hubbardiana** *Schweickerd*t in Notizbl. Bot. Garten u. Mus. Berlin--Dahlem. 14. nr. 122. 196 (1938).

A slender *annual*. *Culms* erect or somewhat geniculately ascending, up to 50 cm. high, not very rigid, about 7-noded, markedly branched from the nodes; internodes up to 10 cm. long, always exserted, subterete or compressed, striate and glabrous; nodes glabrous and always exserted. *Leaf-sheaths* about 2.5–3 cm. long, glabrous, striate, compressed, slightly keeled, lax, scaberulous towards the margin, always shorter than the respective internode and smooth. *Ligule* reduced to a ring of short hairs; auricles glabrous more rarely somewhat bearded. *Leaf-blades* up to 12 cm. long but often much shorter, flat or conduplicate, about 2 mm. wide, the margins minutely scaberulous and involute upwards, glabrous and striate on the lower surface, upper surface striate, minutely scaberulous and bearing a few long hairs towards the ligule. *Panicle* well-exserted, up to 6 cm. long, densely glomerate and spike-like, obovate in outline; rhachis striate, angular; branches very short and scaberulous. *Spikelets* densely congested, subsessile, lanceolate. *Glumes* about 7 mm. long, subequal, linear-lanceolate; the lower awned often from a bifid apex, awn and keel scaberulous, minutely scaberulous upwards towards the margin; the upper emarginate and shortly awned, keel glabrous, slightly scaberulous upwards towards the margin. *Lemma* lanceolate, up to 7 mm. long, 3-nerved, markedly scabrous in its upper two-thirds, glabrous towards the base, the margins more or less involute. *Callus* very short, rounded, densely bearded. Awns scabrous, up to 30 mm. long, the lateral often much shorter.

SOUTH WEST AFRICA.

Tsumeb, IV. 1934, *Dinter* 7600 (B); Ossa, III. 1939, *Volk* 1557 (D).

TYPE SPECIMEN.

Dinter 7600 is deposited in the Botanisches Museum, Berlin-Dahlem. This species bears a superficial resemblance to *A. hordeacea* Kunth which, however, belongs to § *Pseudochaetaria* whereas *A. Hubbardiana* mihi must be placed in § *Chaetaria* owing to the absence of an articulation in the lemma. The nearest ally to our species is *A. elliptica* (Nees) Kunth from which it differs in several minor characters. This is another of the rather remarkable cases where two closely allied species are found in South America and Western Africa, respectively!

42. *A. recta* Franchet in Bull. Soc. d'Autun **8**. 365 (1896); Henrard Crit. Rev. **3**. 500 (1928); Henrard Monogr. **2**. 261 cum ic. tab. 125 (1932); Theron in Fedde, Rep. **40**. 22 (1936).

A. atrovioleacea Hack. apud Schinz in Bull. Herb. Boiss. Ser. 2. **6**. 707 (1906); Henrard Crit. Rev. **1**. 45 (1926). *A. Gossweileri* Pilger in Engl. Bot. Jahrb. **39**. 598 (1907); Henrard Crit. Rev. **1**. 206 (1926). *A. Hockii* De Wildeman in Bull. Jard. Bot. Brux. **6**. 39 et tab. 35 fig. 1-6 (1919); Henrard Crit. Rev. **2**. 237 (1927).

Perennial, densely caespitose, erect; innovations intravaginal. *Culms* erect, exserted, elegant, 10-30 cm. high, simple, glabrous, striate, subcompressed, 1-(2)-noded; internodes included. *Leaf-sheaths* subterete, glabrous, striate; the lower somewhat lax and eventually breaking up into fibres; the upper somewhat tighter and with a submembranous margin; *ligule* a ciliolate rim; auricles bearded; collar smooth; *blades* basal, setaceous involute, about up to 20 cm. long (often much shorter) and up to 1 mm. wide, striate, smooth on the lower surface, upper surface scaberulous, subobtuse or acute, often somewhat curved or flexuous. *Panicle* ovate-lanceolate in outline, up to 8 cm. long and 4 cm. wide, lax but not very diffuse; axis filiform, smooth, scaberulous upwards, straight or more usually somewhat flexuous; branches capillary, scaberulous, flexuous, ascending, binate or 3-5-partite, naked in their lower half to one-third, the lower branches up to 3 cm. long, the upper much shorter; pedicels much longer to shorter than the glumes. *Spikelets* aggregated towards the end of the branches, brownish-purple to dark-purple. *Glumes* subequal to unequal; the lower lanceolate-ovate, shortly awned, 1-nerved, 3-keeled, scabrous along the keels, 2.5-6 mm. long; the upper linear-lanceolate, shortly awned, 1-nerved, glabrous, 5-7.5 mm. long. *Lemma* tubulous, somewhat narrowed upwards into a short column, smooth, pallid or grey in colour, scaberulous below the awns, 4-5 mm. long; *callus* about 0.25 mm. long, rounded and obtuse, shortly bearded; awns subequal, scabrous, curved or flexuous, purple.

SOUTHERN RHODESIA.

Salisbury, IX. 1919, *Eyles* 1795 (BH, N, S).

TRANSVAAL PROVINCE.

Ermelo distr.: Amsterdam, X. 1935, *Norval* 24 (N). Pretoria distr.: Premier Mine, X. 1917, *Moss* 3165 (N, WR, W).

NATAL PROVINCE.

Newcastle distr.: Newcastle, X. 1893, *Schlechter* 3414 (A, B, BH, BM, G, K, N, P, V, Z).

TYPE SPECIMEN.

Brazza 226 is deposited in the Museum d' Histoire Naturelle, Paris.

43. *A. Galpinii* Stapf in Kew Bull. **1910** p. 130; Phillips in Ann. S. Afr. Mus. **16**. 347 (1917); Henrard Crit. Rev. **1**. 190 (1926); Henrard Monogr. **2**. 305 cum ic. tab. 148 (1932).

Perennial, densely caespitose, leafy, with many innovations. *Culms* erect, simple, up to 45 or 50 cm. high but usually somewhat smaller, very elegant, glabrous, 1-2-noded, more usually one-noded; internodes compressed, striate. *Leaf-sheaths* tight; the lower pallid or often tinged with purple, persistent, striate, glabrous; *ligule* a ciliolate rim; auricles bearded with hairs up to 4 mm. long; collar glabrous; *blades* setaceous, convolute, up to 30 cm. long, acute, somewhat rigid and flexuous, often plicate, glabrous on the lower surface, scaberulous on the upper surface. *Panicle* somewhat contracted, oblong, lax and flexuous; peduncle and axis subterete and striate, scabrous; branches distant, filiform, scaberulous, solitary, about 2-flowered; pedicels scaberulous, unequal, subcompressed and clavate at the apex. *Spikelets* yellowish-brown to purple, suberect. *Glumes* 1-nerved, unequal, lanceolate, more or less abruptly acuminate and mucronate; the lower scabrous on the keel and usually so on the back, 6-10 mm. long; the upper glabrous on the keel

but usually scabrous on the back, 9–14 mm. long. *Lemma* tubulous or lanceolate, narrowed upwards into the short beak, purplish, glabrous or minutely scaberulous dorsally upwards, 7–9 mm. long; *callus* \pm 1 mm. long, shortly and densely bearded, obtuse; awns setaceous, spreading, subequal, the central up to 25 mm. long, the lateral up to 20 mm. long.

CAPE PROVINCE.

Kingwilliamstown distr.: Keiskama Hoek, XII. 1925, *Dyer* 257 (A, N, W); do., II. 1924, *Schönland* 4459 (A); Hogs Back, I. 1920, *Rattray* 440 (A). Stutterheim distr.: Glencairn, IV. 1928, *Galpin* 2417 (A, K, N). Barkly East distr.: Ben McDhui, III. 1904, *Galpin* 6900 (A, B, D, K, N, S). Mount Currie distr.: Kokstad, IV. 1918, *Mogg* 5013 (N).

NATAL PROVINCE.

Bergville distr.: Mt. Aux Sources, II. 1926, *Bayer et McClean* 24 (K, N, W).

BASUTOLAND.

Maluti mountains, *Staples* 112 (N).

TYPE SPECIMEN.

Galpin 6900 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

ECONOMIC NOTES.

This species is considered unpalatable even in the young condition.

44. ***A. curvata*** (Nees) Trin. et Rupr. Spec. Gram. Stip. 133 (1842); Walp. Ann. Bot. **3**. 743 (1852); Steud. Syn. Pl. Glum. **1**. 138 (1854); Dur. et Schinz, Consp. **5**. 802 (1894); Henrard Crit. Rev. **1**. 124 (1926); Henrard Monogr. **2**. 318 cum ic. tab. 156 (1932); Range in Fedde, Rep. **33**. 8 (1933).

A. curvata (Nees) Trin. et Rupr. var. *nana* (Nees) Henrard Crit. Rev. **3**. 487 (1928); Henrard Monogr. **2**. 318 (1932); Range in Fedde, Rep. **33**. 8 (1933). *A. adscensionis* L. sec. Stapf in Dyer, Fl. Cap. **7**. 554 (1899) excl. syn. pro parte; F. Bolus in Ann. S. Afr. Mus. **9**. IV. 231 (1915) pro parte; Phillips in Ann. S. Afr. Mus. **16**. 346 (1917) pro parte; Garabedian in Ann. S. Afr. Mus. **16**. II. 400 (1925); Stent in Bothalia **1**. IV. 277 (1924), omnes non Linn. *A. adscensionis* L. var. *coerulescens* (Trin. et Rupr.) Dur. et Schinz, Consp. **5**. 799 (1894) pro parte; Hack. in Bull. Herb. Boiss. **4**. Append. III. 19 (1896); Garabedian in Ann. S. Afr. Mus. **16**. II. 400 (1925), omnes non Trin. et Rupr. *A. adscensionis* L. var. *pygmaea* (Trin. et Rupr.) Dur. et Schinz, Consp. **5**. 800 (1894). *A. adscensionis* L. var. *strictiflora* (Trin. et Rupr.) Dur. et Schinz, Consp. **5**. 800 (1894). *A. angustata* Stapf sec. Potts et Tidmarsh in Journ. S. Afr. Bot. **3**. III. 88 (1937), non Stapf. *A. caerulescens* Desf. var. *brevisetula* Hack. in Engl. Bot. Jahrb. **11**. 400 (1889); Henrard Crit. Rev. **3**. 694 (1928). *A. confusa* Trin. et Rupr. Spec. Gram. Stip. 134 (1842); Henrard Crit. **1**. 112 (1926). *A. junciformis* Trin. et Rupr. sec. Stent in Bothalia **1**. IV. 277 (1924) pro parte, non Trin. et Rupr. *A. pusilla* Trin. et Rupr. Spec. Gram. Stip. 140 (1842); Steud. Syn. Pl. Glum. **1**. 139 (1854); Presl, Bot. Bemerk. 121 (1844); Dur. et Schinz, Consp. **5**. 807 (1894); Henrard Crit. Rev. **3**. 487 (1928). *A. pygmaea* Trin. et Rupr. Spec. Gram. Stip. 133 (1842); Walp. Ann. Bot. **3**. 743 (1852); Steud. Syn. Pl. Glum. **1**. 138 (1854); Henrard Crit. Rev. **3**. 488 (1928). *A. strictiflora* Trin. et Rupr. Spec. Gram. Stip. 134 (1842); Walp. Ann. Bot. **3**. 743 (1852); Steud. Syn. Pl. Glum. **1**. 138 (1854); Henrard Crit. Rev. **3**. 600 (1928). *Chaetaria curvata* Nees, Fl. Afr. Austr. 186 (1841). *Chaetaria curvata* Nees β *minor* Nees, Fl. Afr. Austr. 187 (1841); Presl, Bot. Bemerk. 121 (1844). *Chaetaria mauritiana* (Kunth) Nees var. β *Nana* Nees, Fl. Afr. Austr. 188 (1841); Presl, Bot. Bemerk. 121 (1844).

A tufted annual, including the inflorescence up to 60 cm. high or even taller, at times very much smaller and dwarfed. Culms erect or somewhat geniculately ascending, more or less branched from the base and from the lower nodes, terete, striate, smooth, the upper nodes well-exserted. Leaf-sheaths more or less shorter than the internodes, tight, often slipping from the culms, compressed and keeled, smooth to scaberulous, striate, margins hyaline; ligule a ciliolate rim; auricles pubescent; collar glabrous; blades narrowly linear, tapering to a fine point, flat at the base or more usually folded throughout their length, up to 15 cm. long and 1–2 mm. wide, glabrous and striate on the lower surface, scabrous hirtellous on the upper surface, margins thickened. Panicle exserted, dense,

rather narrow, up to 20 cm. long, 1-2 cm. broad, more or less interrupted at the base, axis scabrous, terete below, angular upwards; branches scabrous, binate or branched almost from the base, the longer branches often peduncled, the shorter subsessile; pedicels scabrous, fairly short. *Spikelets* yellowish, greenish or tinged with purple. *Glumes* unequal, linear-lanceolate to lanceolate-oblong; the lower 4-7 mm. long, emarginate and shortly mucronate at the apex, scabrous on the keel and strigose on the flanks, laterally compressed; the upper up to 8 mm. long, smooth on the keel below, scaberulous upwards, bifid and with a short apical mucro from the sinus. *Lemma* usually purple-mottled, compressed, punctulate all over, scabrous on the keel, at times scabrous on the flanks upwards, up to 10 mm. long; *callus* rounded, densely bearded, 0.5-0.75 mm. long; awns erect or spreading, scabrous, unequal; the central about 20 mm. long, the lateral about 15 mm. long.

SOUTH WEST AFRICA.

Otjinga, III. 1939, *Volk* 1396 a (D); Hollywood, II. 1939, *Volk* 1229 (D); Otjikongo, II. 1939, *Volk* 1294 (D); Asis, anno 1939, *Volk* 652 (D) et 653 (D) et 722 (D); Fockshof, anno 1939, *Volk* A. 157 (D); Ossa, III. 1939, *Volk* 1558 (D); Tsumeb, IV. 1934, *Dinter* 7444 a pro parte (G); Waterberg, V. 1928, *Bradfield* 377 (N); Spitzkopje, I. 1937, *Boss* TM. 36410 (T); Okahandja, II. 1903, *Dinter* s.n. (B, N); do., *Bertling* 14 (B); Otjimbingue, V. 1886, *Marloth* 1379 (B); Windhuk, *Bohr* 40 (B); do., III. 1910, *Mücke* 47 (N); between Mariental and Gibeon, III. 1913, *Engler* 6596 (B); Gründoorn, II. 1909, *Pearson* 3118 (K, T) et 3129 (A, BH, K, N, S) et 3160 (K); Sabiesis, II. 1909, *Pearson* 4118 (K); Kunab, IV. 1911, *Range* 1007 (B); Kuibis, V. 1909, *Range* 652 (B); Schakalskuppe, VII. 1913, *Range* 1771 (B); Sandverhaar, II. 1909, *Pearson* 4625 (BH, K) et 4674 (K, N); Akam River basin, II. 1909, *Pearson* 4745 (G, K); Chamis, IX. 1905, *Schulze* 418 (B); Seeheim, II. 1909, *Schäfer* 44 (B); Gawachab, II. 1909, *Pearson* 4332 (BM, N); Klein Karas, IV. 1931, *Oertendahl* 118 (B, K, N); Noachabeb, *Blank* 53 (B); Great Karasberg, I. 1913, *Pearson* 8493 (BH, BM, K, N, S); Ganus, II. 1909, *Pearson* 4490 (K, N); Kanuchas, IV. 1912, *Range* 1399 (B).

CAPE PROVINCE.

Little Namaqualand distr.: Between Natvoet and Orange River, *Drège* (B, BM, K, N, O, P, S); *Pella*, I. 1909, *Pearson* 3557 (K); Iaus, IX. 1897, *Schlechter* 11226 (A, B, N, W); Khamiesberg, XII. 1936, *Adamson* 1547 (N). Upington distr.: Upington, VIII. 1923, *Borchards* H. 21519 (N); Riemvastmaak, VII. 1925, *Barnard* 36147 (S); Louisvale, II. 1930, *Mennell* s.n. (W). Calvinia distr.: Springbokkuil, *Zeyher* 42 (B, S); between Losper's Plaats and Springbokkuil River, *Zeyher* 1817 (BM, G, K, V, Z). Ceres distr. Yuk Rivier, VII. 1811, *Burchell* 1266 (BM, K). Prince Albert distr.: Prince Albert, XII. 1904, *Bolus* 11670 (BH); Prince Albert Road, V. 1920, *Pillans* 21783 (BH). Victoria West distr.: Nobelsfontein, II. 1931, *Thorne* 49453 (S). Murraysburg distr.: Murraysburg, *Thorne* 10635 (A, T). Graaff-Reinet distr.: Graaff-Reinet, Sunday River, *Drège* (B, BM, G, K, N, O, P); Graaff-Reinet, III. 1868, *Bolus* 678 (A, BH, BM, K, V). Somerset East distr.: Somerset East, *McOwan* s.n. (S. 17873); Klein Visch Rivier, *McOwan* s.n. (S. 19379); Uitenhage distr.: Uitenhage, *Zeyher* 103.4 (A, G, K, V, Z); Steenbokvlakte north of Winterhoeksberg, *Ecklon et Zeyher* (B, N, S). Queenstown distr.: *Everett* 39 (N). Barkly East distr.: Barkly East, II. 1934, *Greyvenstein* 8 (N). Albert distr.: Burghersdorp, *Cooper* 778 (D, K, Z); do., *Cooper* 1364 (BM, D, G, K, N, V, Z). Middelburg distr.: Middelburg, IV. 1922, *Gill* 44 (A, N, W); Rosmead Junction, III. 1911, *Pillans* 1804 (K). Philipstown distr.: Potfontein, III. 1933, *Schweickerdt* 1187 (N). Britstown distr.: Britstown, III. 1917, *Wilman* (B. 15149); 21 miles west of De Aar, X. 1928, *Pole Evans* 2230 (N). Prieska distr.: Prieska, IV. 1931, *Bryant* 606 (B, K, W); Spitzkop, III. 1920, *Bryant* K. 28 (N, W); Stofbakkies, III. 1934, *Wilman* 3131 (K, Mc). Herbert distr.: Campbell Kloof, II. 1937, *Wilman* s.n. (K); St. Clair, III. 1898, *Orpen* 254 (A, N); Honeynestkloof, III. 1920, *Wilman* s.n. (K); do., XI. 1929, *Phillips* 3469 (K, N) et 3468 (W). Kimberley distr.: Kimberley, II. 1913, *Wilman* 687 (Mc); do., VII. 1929, *Hitchcock* 24097 (K, W); Warrenton, IV. 1904, *Adams* 197 (T, V, Z); do., III. 1920, *Adams* s.n. (N). Mauritzfontein,

I. 1934, *Pocock* s.n. (U). Hay distr.: Wittewater, II. 1812, *Burchell* 2006 (G, K) et 2083 (A, B, K, P, V); Vaalwater, III. 1921, *Wilman* 1428 (K, Mc); Postmasburg, I. 1925, *Wilman* s.n. (U); near Griquatown, II. 1937, *Wilman* s.n. (K). Taungs distr.: Taungs, *Squire* H. 118 (N). Vryburg distr.: Vryburg, IV. 1912, *Sharpe* H. 7475 (N); do., III. 1920, *Theiler* H. 20239 (N); do., III. 1921, *Mogg* in Hb. Stell. 12541 (St). Without precise locality: *Carmichael* 51 (BM); *Burke et Zeyher* 1817 (O, P).

NATAL PROVINCE.

Estcourt distr.: Colenso, *Rehmann* 7182 (Z).

BASUTOLAND.

Leribe distr.: Leribe, *Dieterlen* 199 b (D, K, P pro parte, S); do., *Buchanan* 231 (S); Quthing distr.: Leloaleng, I. 1916, *Dieterlen* 1190 (N, P).

ORANGE FREE STATE.

Jacobsdal distr.: Jacobsdal, *Schweickerdt* 1151 (N). Fauresmith distr.: Fauresmith, XII. 1927, *Smith* 5178 (K) et I. 1928, *Smith* 5571 (K, N); Luckhoff, III. 1917, *Pole Evans* H. 11603 (N). Bloemfontein distr.: Bloemfontein, III. 1933, *Tidmarsh* 4931 (K) et 4933 (GU) et 4935 (GU). Senekal distr.: Senekal, XII. 1931, *Goossens* 942 (B, N). Kroonstad distr.: Kroonstad, II. 1928, *Pont* 9 (Z) et 58 (N, Z) et 60 (Z); do., III. 1931, *Guldenpfennig* 81 (N). Without precise locality: *Buchanan* 62 (D) et 66 (D) et 283 (BH, K) et 289 (D); *Rehmann* 3599 (Z).

TRANSVAAL PROVINCE.

Bloemhof distr.: Christiana, III. 1912, *Burt Davy* 14146 (N); do., I. 1934, *Theron* 563 (N). Potchefstroom distr.: Machavie, III. 1927, *Lane* 9 a (N) et 14 a (N). Johannesburg distr.: Johannesburg, IX. 1925, *Robinson* s.n. (N). Pretoria distr.: Pretoria, III. 1905, *Burt Davy* 185 (BH, K); do., III. 1929, *Skea* 63 (N); do., VI. 1912, *Theiler* 12022 (T); do., *Appleton* 42 (K). Rustenburg distr.: Rustenburg, II. 1933, *van Nouhuys* TM. 31894 (T). Marico distr.: Groot Marico, IV. 1927, *Liebenberg* S. 41 (N) et S. 45 (N). Waterberg distr.: Naboomspruit, III. 1923, *Galpin* M. 567 (N); Potgietersrust, IV. 1906, *Burt Davy* 2246 (N); do., III. 1921, *Galpin* 8892 (K, N). Pietersburg distr.: Pietersburg, IV. 1927, *Briggs* 10 (N); Duivelskloof, V. 1929, *Galpin* 11346 (N). Zoutpansberg distr.: Palmaryville, VI. 1930, *Koker* 10 (N); Messina, XII. 1917, *Moss et Rogers* 218 (Z). Barberton distr.: Barberton, V. 1930, *Thorncroft* 43 (N). Ermelo distr.: Nooitgedacht, I. 1927, *Henrici* 1473 (N).

BECHUANALAND PROTECTORATE.

Francistown, IV. 1929, *Gordon* 52 (N). Mochudi, V. 1914, *Harbor* s.n. (BH, D).

TYPE SPECIMEN.

Ecklon (et Zeyher) from Uitenhage is deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAMES.

Bruine-gras. Steekgras. Stickgrass.

ECONOMIC NOTES.

This species, while young, is excellent for feeding cattle and sheep. In the mature state it is no longer palatable. The mature florets are very troublesome in wool and the awns often penetrate the skins of animals. The florets furthermore cause lameness in animals by penetrating the regions between their claws.

45. **A. submucronata** Schumacher. in Sel. phys. og Mathem. Skr. **3**. 67 (1827); Henrard Crit. Rev. **3**. 609 (1928); Henrard Monogr. **2**. 321 cum ic. tab. 157 (1932).

A. Thonningii Trin. et Rupr. Spec. Gram. Stip. 137 (1842); Henrard Crit. Rev. **3**. 632 (1928).

Annual, tufted. Culms erect, or somewhat geniculately ascending, branched from near the base and the lower nodes, including the panicle up to 75 cm. high; internodes terete, striate, exserted; nodes rather swollen, glabrous. *Leaf-sheaths* tight and terete, at length fairly lax, keeled and slipping from the culms, striate, smooth to slightly scaberulous, shorter than the internodes; *ligule* a ciliate rim; auricles ciliate; collar glabrous; *blades* narrowly linear, up to 40 cm. long and 1–2 mm. wide, flat or involute, scaberulous on both surfaces, margins thickened. *Panicle* erect, subspiciform, interrupted; branches fairly shortly peduncled and subsessile, especially the upper, fascicled; pedicels fairly short. *Spikelets* greenish suffused with purple, yellowish at maturity, erect, congested. *Glumes* unequal, linear-lanceolate; the lower scabrous along the keel and more or less so on the flanks, up to 6 mm. long, gradually tapering into the short awn; the upper somewhat scabrous along the keel, bilobed with a short awn from the sinus, up to 7 mm. long. *Lemma* compressed, exceeding the glumes, about 9 mm. long, purple-mottled, scabrid along the keel upwards, or even scabrous in the upper half, punctulate; *callus* rounded, densely bearded, about 0.5 mm. long; awns subequal to unequal, very scabrous, winged, up to 15 mm. long.

SOUTH WEST AFRICA.

Grootfontein, II. 1933, *Schoenfelder* 74 (K, N); Waterberg, IV. 1928, *Bradfield* 377 (N); Omane, II. 1939, *Volk* 1148 (D); Gross Otavi, IV. 1939, *Volk* 581 b (D); Runtu, V. 1939, *Volk* 1714 (D); Kwartel near Rehoboth, IV. 1911, *Dinter* 2169 (B).

ORANGE FREE STATE.

Mudrivierdrift, *Rehmann* 3599 (B).

TRANSVAAL PROVINCE.

Pretoria distr.: Onderstepoort, II. 1936, *Mogg* 13797 (N).

BECHUANALAND PROTECTORATE.

Francistown, V. 1929, *Francis* 109 (N); Selika near Palapye, IV. 1928, *Nobbs* 97 (U); Mochudi, I. 1914, *Rogers* 6575 (A, G, K, N, W, WR, Z); do., III. 1915, *Rogers* 6598 (G).

TYPE SPECIMEN.

The type "*Guin. Dr. Thon. 356*" is deposited in the Schumacher Herbarium, Copenhagen.

ECONOMIC NOTES.

This species is only eaten in the pre-flowering condition by bovines.

46. **A. adscensionis** L. subsp. **guineënsis** (Trin. et Rupr.) Henrard Crit. Rev. **1**. 216 (1926); Henrard Monogr. **2**. 325 cum ic. tab. 159 (1932).

A. adscensionis Linn., sec. Obermeijer, Schweickerdt et Verdoorn in *Bothalia* **3**. II. 227 (1937), non Linn. *A. guineënsis* Trin. et Rupr. Spec. Gram. Stip. 137 (1842); Walp. Ann. Bot. **3**. 744 (1852); Steud. Syn. Pl. Glum. **1**. 139 (1854).

Plants placed under this subspecies superficially greatly resemble slender specimens of *A. curvata* (Nees) Trin. et Rupr., but may be distinguished from this species by the following characters: *Panicle* long and many-flowered, branches thin and spreading, naked at the base, the whole thus being lax and interrupted. The *glumes* and *lemmas* are usually shorter than those of typical *A. curvata* (Nees) Trin. et Rupr.

TRANSVAAL PROVINCE.

Kruger National Park: Hippopool on Sabi River, III. 1937, *Obermeijer* TM. 36088 (K, T). Waterberg distr.: Crecy, *Carver* 8 (N). Zoutpansberg distr.: Zoutpan, IV. 1934, *Schweickerdt et Verdoorn* 472 (N); Messina, III. 1929, *Staples* 858 (K, N); do., III. 1933, *du Plessis* s.n. (K, N).

TYPE SPECIMEN.

The type *Thonnig* s.n. is deposited in the Imperial Herbarium, Leningrad.

47. *A. barbicollis* Trin. et Rupr. Spec. Gram. Stip. 135 (1842); Walp. Ann. Bot. **3**. 746 (1852); Steud. Syn. Pl. Glum. **1**. 141 (1854); Dur. et Schinz, Consp. **5**. 800 (1894); Stapf in Dyer, Fl. Cap. **7**. 559 (1899); Medley-Wood, Natal Plants **5**. tab. 401 cum descr. (1905); Stent in Bothalia **1**. IV. 278 (1924); Henrard Crit. Rev. **1**. 48 (1926); Henrard Monogr. **1**. 132 cum ic. tab. 50 (1929); Obermeijer, Schweickerdt et Verdoorn in Bothalia **3**. II. 227 (1937); Potts et Tidmarsh in Journ. S. Afr. Bot. **3**. III. 88 (1937).

A. barbicollis Trin. et Rupr. var. *conglomerata* Henr. Crit. Rev. Supplem. 705 (1933). *Chaetaria Forskohl* Nees, Fl. Afr. Austr. 188 (1841), nor *A. Forskohl* Tausch (1836).

Perennial, densely tufted, somewhat glaucous, with innovations usually present. *Culms* simple or branched from the lower nodes, several-noded, erect or geniculately ascending, slender, wiry, up to 60 cm. tall or somewhat taller; internodes distinctly compressed, glabrous or slightly scabrous; nodes glabrous exserted. *Leaf-sheaths* glabrous or somewhat scabrous upwards, the lower strongly compressed and keeled, the upper less so, tight or at length slipping from the culms, shorter than the internodes; *ligule* a ciliolate rim; auricles glabrous or densely long-bearded; collar bearded or glabrous; *blades* narrow linear, the apex rather obtuse, up to 20 cm. long but often much shorter, folded or convolute, curved or flexuous, the lower surface striate and glabrous, the upper scabrous to hispidulous. *Panicle* composed of many peduncled spreading and divaricate false spikes, rather open, up to 15 cm. long and 5–10 cm. broad, variable in shape and size; axis erect, at length somewhat flexuous, angular, scabrous; branches solitary or binate, distant, suberect or spreading, straight or flexuous, scabrous, usually naked at the base for several centimetres; branchlets and pedicels congested to form false secondary spikes, scabrous. *Spikelets* usually brownish, often suffused with purple, congested. *Glumes* subhyaline, keeled, glabrous; the lower lanceolate, up to 6 mm. long, scabrous on the keel and on the flanks near the apex, shortly awned; the upper linear, somewhat scabrous on the keel and on the flanks upwards, shortly awned up to 8 mm. long. *Lemma* tubulous, glabrous below, distinctly scabrous upwards, including the callus and awns about 7–8 mm. long; *callus* 1 mm. long, densely bearded; *colum* of awns about 2.5 mm. long, twisted, scabrous; awns subequal, spreading, ~~fine~~, scabrous, about 1.5–2 cm. long.

SOUTH WEST AFRICA.

Okahandja, V. 1928, *Bradfield* 277 a (N).

CAPE PROVINCE.

Prince Albert distr.: Weltevreden, *Drège* (K). Graaff-Reinet distr.: Sundays River, *Drège* [3879] (B, K, N, O, P, S); Graaff-Reinet, *Bolus* 677 (A, BH, D, K, V) et 679 (A, BM). Somerset East distr.: Somerset East, *McOwan* 1789 (BM, S) et 1657 (S). Uitenhage distr.: Between Koega and Sunday River, *Ecklon et Zeyher* 76 (N, S) et *Ecklon* s.n. (K); Enon, *Drège* 3881 (B, O); Albany distr.: Grahams-town, II. 1904, *Black* 23 (B, T); Botha's Hill, XII. 1894, *Schlechter* 6097 (A, B, BM, G, K); do., XII. 1926, *Britten* 5513 (A); do., V. 1928, *Dyer* 1439 (A, K, N); Carlisle Bridge, V. 1921, *Bowker* 6 (A); Peddie Road, IV. 1928, *Dyer* 1365 (A, K). Bathurst distr.: Kowie; *Hutton* 5 (A). Fort Beaufort distr.: Between Kunap and Kat Rivers, *Drège* 3881 (B), Adelaide, *Marloth* 3683 (B, N); Koonap Heights, IV. 1920, *Britten* 2041 (A). East London distr.: Nahoon Causeway, *Rattray* 1361 (N). Komgha distr.: Komgha, *Flanagan* 100,

(N) et 1010 (BH, S); Kei Bridge, III. 1909, *Rogers* 4513 (A). Kentani distr.: Kentani, III. 1909, *Pegler* 238 (BH). Queenstown distr.: Queenstown, *Everett* 49 (N); Shiloh, *Baur* 55 (N); Sterkstroom, II. 1917, *Burt Davy* 17059 (BH); Klaas Smits R. Bridge, III. 1928, *Galpin* 2355 (K, N). Xalanga distr.: Tsomo River, *Pegler* 1708 (BH). Wodehouse distr.: Sterkstroom, XI. 1901, *Sim* 2810 (A). Qumbu distr.: Tsitsa River, I. 1895, *Schlechter* 6374 (A, B, BH, BM, G, K, P, V). Colesberg distr.: Colesberg, *Drège* (K). Herbert distr.: Campbell, III. 1920, *Pole Evans* 11 (K). Prieska distr.: Prieska, III. 1931, *Bryant* 605 (K). Kimberley distr.: Kimberley, VII. 1929, *Hitchcock* 24099 (K, N, W); Rooipoort, III. 1923, *Wilman* 2222 (K, Mc); Kareeboom, III. 1921, *Wilman* 1425 (K, Mc, U); Du Toitspan, *Tuck* s.n. (K); near Vaalrivier, IV. 1886, *Schenck* 794 (N, Z). Kuruman distr.: III. 1931, *Lawson* 15031 (BH).

NATAL PROVINCE.

Umzinto distr.: Dumisa, I. 1915, *Rudatis* 2190 (St.) Ixopo distr.: Ixopo, III. 1935, *Otto* 1 a (N). Pietermaritzburg distr.: Pietermaritzburg, XI. 1930, *Goossens* 153 (N, W) et II. 1934, *Howes* 9 (K, W). Estcourt distr.: Winterton, I. 1933, *King* 386 (N); Colenso, II. 1891, *Medley Wood* 4418 (D, K); do., III. 1894, *Kuntze* s.n. (B). Helpmakaar distr.: Umsinga, *Buchanan* 90 (K). Bergville distr.: Acton Homes, I. 1920, *Doidge* H. 19837 (N) et H. 19839 (N). Zululand: XII. 1898, *Jenkinson* 40 (D, N). Without precise locality: *Gerrard et McKen* 167 (D); *Buchanan* 290 (B, D, K); *Medley Wood* 3588 (D, K).

BASUTOLAND.

Quthing distr.: Leloaleng, I. 1916, *Dieterlen* 1191 (N, P, S) et 1193 (N, P, S). Leribe distr.: Leribe, *Buchanan* 148 (BH).

ORANGE FREE STATE.

Fauresmith distr.: Fauresmith, I. 1928, *Smith* 5240 a (K) et 5503 (K) et 5572 (N). Bloemfontein distr.: Bloemfontein, II. 1934, *Tidmarsh* 4934 (GU) et II. 1915, *Potts* 1904 (T). Boshof distr.: Neth-el-Pella, IV. 1931, *Wolff* 11 (N). Hoopstad distr.: Hoopstad, II. 1933, *Goossens* 1277 (N); Great Vetrivier, *Burke* 210 (K, S) et *Burke et Zeyher* 1816 (O, P, V) et *Zeyher* 1816 (BM, S). Without precise locality: *Buchanan* 57 (D, K).

TRANSVAAL PROVINCE.

Bloemhof distr.: Christiana, III. 1912, *Burt Davy* 13031 et 13105 et 14102 et 14143 (omnes N) et II. 1904, *Burt Davy* 1609 (N). Potchefstroom distr.: Potchefstroom, XI. 1927, *Liebenberg* 1067 (N). Johannesburg distr.: Johannesburg, III. 1924, *Moss* 9840 (WR); do., VII. 1929, *Hitchcock* 24102 (K, N, W) et 24134 (K, W). Pretoria distr.: Pretoria, III. 1920, *Burt Davy* 18811 (K); do., *Smith* 81 (N) et 2288 (N); do., XI. 1934, *Liebenberg* 3210 (N); do., *Appleton* 22 (B, K); do., *Leendertz* 1095 (T); do., X. 1929, *Sandwith* 94 (K) et 95 (K); Premier Mine, II. 1924, *Rogers* 25323 (St); Hartebeestpoort, XI. 1925, *Moss* 12014 (K, WR); Baviaanspoort, IV. 1927, *Moss* 14161 (WR). Rustenburg distr.: I. 1909, *Collins* 6865 (T). Waterberg distr.: Warmbaths, I. 1936, *Irvine* 23 (N); Naboomspruit, II. 1919, *Galpin* M. 422 (N, W) Pongola River, XII. 1919, *Burt Davy* 18265 (K). Pietersburg distr.: Pietersburg, IV. 1927, *Briggs* 11 (N); do., II. 1904, *Bolus* 10901 (A, BH, K, N); Daviesville, II. 1932, *Markötter* in Hb. *Stell.* 16277 (St); Tzaneen, XI. 1913, *Rogers* 12511 (A, BH, K, N, W); The Downs, XI. 1917, *Moss et Rogers* 447 (K) et II. 1919, *Junod* 4078 (N, T); Modjadjes, XII. 1915, *Rogers* 18055 (BH). Zoutpansberg distr.: Mara, I. 1929, *Archer* 16 (N); Zoutpan, IV. 1934, *Schweickerdt et Verdoorn* 461 (N); Messina, X. 1929, *Turner* 20 (N); Pafuri River, *Nelson* 54 x (T). Lydenburg distr.: Lydenburg, XII. 1873, *Atherstone* s.n. (A); do., XII. 1893, *Schlechter* 3961 (A, B, BH, BM, G, K, P). Barberton distr.: Nelspruit, XII. 1930, *Liebenberg* 2733 (N); Barberton, I. 1931, *Matthews* 15 (N); Kaapmuiden, XII. 1921, *Rogers* 25083 (T). Swaziland: Black Umbuluzi, V. 1932, *Pole Evans* 3446 (B, K, N, W).

BECHUANALAND PROTECTORATE.

Gaberones, III. 1930, *Van Son* TM. 28609 (BM, N, T); do., IV. 1928, *Nobbs* 6 (U). Mochudi, III. 1914, *Rogers* 6578 pro parte (K). Mahalapye, IV. 1931, *Pole Evans* 3206 (N). Francistown, IV. 1929, *Gordon* 90 (N) et 105 (N).

PORTUGUESE EAST AFRICA.

Lourenco Marques, IX. 1919, *Shantz* 336 (K, W); do., XII. 1897, *Schlechter* 11569 (A, B, BH, N).

TYPE SPECIMEN.

Drège 3881 is deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAMES.

Duin-steekgras. Los-steekgras.

ECONOMIC NOTES.

This species is abundant in disturbed areas. In the young condition it is eaten by cattle and game, but in the more mature condition it forms indifferent grazing. On the whole it is not considered to be of much value as a fodder grass. It stands drought well. In the mature condition it is a pest to sheep farmers and thus is a troublesome weed. The natives use the culms for making brushes.

REMARKS.

This species in its typical form may readily be distinguished from *A. congesta* Roem. et Schult. by the open inflorescence. There are, however, very many intermediates which link up the two species, and such specimens can only be named arbitrarily. It is very probable that much natural hybridisation occurs among these species, since they frequently grow in association and also flower during the same period.

48. *A. alopecuroides* Hack. in Verh. Bot. Ver. Prov. Brandenb. **30**. 114 (1888); Dur. et Schinz, Consp. **5**. 800 (1894); Hack. in Bull. Herb. Boiss. **4**. Append. III. 17 (1896); Garabedian in Ann. S. Afr. Mus. **16**. II. 400 (1925); Henrard Crit. Rev. **1**. 22 (1926); Henrard Monogr. **1**. 121 cum ic. tab. 43 (1929).

Robust caespitose perennial. Culms erect, simple, up to 90 cm. high, 3-4-noded; internodes somewhat compressed, glabrous, smooth and striate; nodes exserted. Leaf-sheaths glabrous, smooth or slightly scaberulous, striate, compressed, tight; ligule a densely ciliate rim; auricles pubescent or bearded; collar pubescent or bearded; blades linear, acuminate, up to 20 cm. long and 3 mm. wide, flat at the base, convolute upwards, glabrous and smooth beneath, scabrous and hirtellous on the upper surface. Panicle exserted, contracted, linear, elongate, spike-like, dense, up to 20 cm. long and 3 cm. broad, interrupted only at the very base; axis terete, scaberulous below; branches solitary, much-branched from near the base; branchlets and pedicels scabrous, short, fascicled, axils pubescent or glabrous. Spikelets erect, linear, scaberulous, congested. Glumes subequal; the lower very scabrous on the keel, including the 4 mm. long awn about 9-10 mm. long; the upper scabrous on the keel upwards, up to 12 mm. long including the 3 mm. long awn, apex bifid. Lemma about 6 mm. long, tubulous, narrowed into the column, granular and finally densely tubercled upwards; callus 1 mm. long, acute, densely hairy; column 4-6 mm. long, twisted, scabrous; awns subequal, 20-25 mm. long, scabrous, spreading.

SOUTH WEST AFRICA.

Olukonda, I. 1886, *Schinz* 656 (K, N, V, Z).

TYPE SPECIMEN.

Schinz 656 is deposited in the Naturhistorisches Museum, Vienna.

49. **A. Pilgeri** Henrard Crit. Rev. 2. 443 (1927); Henrard Monogr. 1. 123 cum ic. tab. 45 (1929).

Robust caespitose *perennial*. Culms erect, including the inflorescence up to 150 cm. high, simple, glabrous, glaucous, striate, terete, 3–6-noded; internodes exserted; nodes glabrous. *Leaf-sheaths* shorter than the internodes, usually pallid, margins finely ciliate; *ligule* minutely ciliate; auricles glabrous or bearded; collar glabrous or bearded with reflexed hairs; *blades* from a flat base, gradually acuminate, laxly convolute upwards, upper leaves involute, up to 35 cm. long, fairly rigid, glabrous on the lower surface, scabrous on the upper surface and along the margins, finely but not prominently nerved. *Panicle* dense, more or less contracted, at times subspicate, up to 40 cm. long and 5 cm. wide; *axis* terete or subangular, striate; branches solitary, up to 11 cm. long, erect or almost adpressed, much-branched from the base; branchlets adpressed. *Spikelets* densely imbricate, shortly pedicelled, pallid. *Glumes* somewhat unequal, awned; the lower 7·5–9 mm. long including the 1·5–2 mm. long awn, scaberulous in the upper half, keel and nerves scabrous, abruptly narrowed into the short awn; the upper 10–12 mm. long including the 2 mm. long awn, linear-lanceolate, keel smooth, bidentate at the apex. *Lemma* 6–7 mm. long including the column, linear or subfusiform, finely punctulate, finely scaberulous towards the apex; *callus* 0·75–1 mm. long, subobtusate, bearded; column of the awns about 1·5 mm. long, scaberulous, twisted; awns almost equal, somewhat spreading, scabrous, 10–20 mm. long.

SOUTH WEST AFRICA.

Omaheke, IV. 1911, *Seiner* 473 (B, W); Grootfontein, IV. 1916, *Hörnig* 165 (B, N); Otjiwarongo, III. 1928, *Bradfield* 278 (K, N); Okahandja, *Dinter* 1523 (B); Otjitjika, IV. 1913, *Dinter* 2938 (B, L, N); Eahero, III. 1913, *Dinter* 3281 (B); Namutoni-Tsinabis, VIII. 1919, *Pole Evans* 19380 (K, N); Asispforte, anno 1939, *Volk* A. 2 (D); Ossa, III. 1939, *Volk* 1831 (D); Neitsas, IV. 1939, *Volk* 380 (D); Blochfontein, V. 1939, *Volk* 1696 (D); Andara, V. 1939, *Volk* 2156 (D); Hollywood, II. 1939, *Volk* 1277 (D).

BECHUANALAND PROTECTORATE.

Raukaboom's Well, IV. 1931, *Pole Evans* 3309 (K, N).

TRANSVAAL PROVINCE.

Pretoria distr.: Aapies River Station, IV. 1939, *de Wit*, 794 (D).

NORTHERN RHODESIA.

Near Namwala, VII. 1932, *Trapnell* 1115 (K).

TYPE SPECIMEN.

Dinter 2938 is deposited in the Rijksherbarium, Leiden.

ECONOMIC NOTES.

Several collectors state this species to be of little or no value as a fodder plant as it is too tough and hard.

50. **A. longicauda** Hack. in Boll. Soc. Brot. 6. 143 (1888); Dur. et Schinz, Consp. 5. 804 (1894); Henrard Crit. Rev. 2. 305 (1927); Henrard Monogr. 1. 122 cum ic. tab. 44 (1929).

Perennial, caespitose, with several innovations. Culms erect, simple or somewhat branched from the upper nodes, up to 80 cm. high; internodes more or less terete or slightly compressed, glabrous and smooth; nodes glabrous, exserted. *Leaf-sheaths* shorter than the internodes, terete or somewhat keeled upwards, glabrous, striate; *ligule* a short ciliate rim; auricles long-bearded but hairs deciduous; collar bearded or glabrous; *blades* convolute, filiform, up to 30 cm. long and 2 mm. wide, glabrous and striate on the lower surface,

scaberulous on the upper surface. *Panicle* long-exserted, densely spike-like, contracted, up to 20 cm. long but often very much shorter, somewhat interrupted at the base; branches solitary, scaberulous, the lower naked at the base, the upper almost sessile, much-branched, adpressed; branchlets and pedicels short, scaberulous, densely fascicled. *Spikelets* congested, shortly pedicelled or subsessile, greenish or tinged with purple. *Glumes* unequal, shortly awned; the lower about 4.5 mm. long, scaberulous on the keel and on the flanks upwards, awn about 2 mm. long; the upper about 6 mm. long, keel glabrous, flanks very minutely strigose upwards, awn about 3 mm. long. *Lemma* tubulous, narrowed into the column, finely granular and somewhat scaberulous dorsally upwards, about 5–6 mm. long including the 1.5 mm. long densely bearded acute *callus*; column about 5 mm. long, twisted, scaberulous; awns fine, spreading, scaberulous, subequal, up to 2.5 cm. long.

TRANSVAAL PROVINCE.

Barberton distr.: Komatipoort, XI. 1917, *Moss et Rogers* 608 (D, WR).

PORTUGUESE EAST AFRICA.

Lourenco Marques, X. 1919, *Shantz* 338 (K, W); do., IV. 1927, *Vaughan* s.n. (K); Mocambique, *Carvalho* 35 (N, V).

TYPE SPECIMEN.

Carvalho 35 is deposited in the Naturhistorisches Museum, Wien.

51. **A. congesta** Roem. et Schult., Syst. Veg. **2**. 401 (1817); Kunth, Enum. **1**. 195 (1833); Trin. et Rupr. Spec. Gram. Stip. 153 (1842); Walp. Ann. Bot. **3**. 746 (1852); Steud. Syn. Pl. Glum. **1**. 142 (1854); Dur. et Schinz, Consp. **5**. 802 (1894); Hack. in Bull. Herb. Boiss. **4**. Append. III. 18 (1896); Stapf in Dyer, Fl. Cap. **7**. 558 (1899); Medley-Wood, Natal Plants **5**. tab. 484 cum descr. (1908); Marloth, Fl. S. Afr. **4**. 21 tab. 6 fig. F 1–4 (1915); Phillips in Ann. S. Afr. Mus. **16**. 347 (1917); Dinter in Fedde, Rep. **15**. 341 (1918) pro parte; Stent in Bothalia **1**. IV. 277 (1924); Garabedian in Ann. S. Afr. Mus. **16**. II. 401 (1925); Henrard Crit. Rev. **1**. 113 (1926); Henrard Monogr. **1**. 126 cum ic. tab. 47 (1929); Range in Fedde, Rep. **33**. 8 (1933); Mogg in S.A. Journ. Science **31**. 394 (1934); Potts et Tidmarsh in Journ. S. Afr. Bot. **3**. III. 88 (1937).

A. barbicollis Trin. et Rupr. sec. Range in Fedde, Rep. **33**. 8 (1933), non Trin. et Rupr. *A. adscensionis* L. sec. F. Bolus in Ann. S. Afr. Mus. **9**. IV. 231 (1915) pro parte, non Linn. *A. coarctata* Licht. ex Roem. et Schult., Syst. Veg. **2**. 401 (1817) in syn., non H. B. K.; Henrard Crit. Rev. **3**. 699 (1928). *A. congesta* Roem. et Schult. var. *genuina* Chiov., Fl. Eritr. 383 (1899); Henrard Crit. Rev. **1**. 115 (1926). *A. Rangei* Pilger in Engl. Bot. Jahrb. **48**. 344 (1912); Dinter in Fedde, Rep. **15**. 342 (1918); Garabedian in Ann. S. Afr. Mus. **16**. II. 404 (1925); Henrard Crit. Rev. **3**. 498 (1928); Henrard Monogr. **1**. 121 cum ic. tab. 44 (1929); Range in Fedde, Rep. **33**. 9 (1933). *Chaetaria congesta* (Roem. et Schult.) Nees, Fl. Afr. Austr. 189 (1841).

Perennial, densely tufted, somewhat glaucous, with a few innovations nearly always present, at times a dwarf annual. *Culms* simple or branched from the lower nodes, wiry, slender, erect or somewhat geniculately ascending, several-noded, up to 75 cm. high, but frequently much smaller; internodes usually somewhat compressed especially below, glabrous, exserted; nodes glabrous. *Leaf-sheaths* compressed, striate, glabrous or slightly scaberulous towards the ligule, the lower pallid and strongly keeled, the upper at times somewhat keeled; *ligule* a ciliolate rim; auricles glabrous or densely long-bearded; collar glabrous or minutely pubescent; *blades* linear, terminating in a subobtuse tip, up to 20 cm. long, folded or convolute, usually somewhat curved or flexuous, glabrous and striate on the lower surface, scaberulous on the upper surface. *Panicle* dense, spike-like but frequently interrupted at the base by 1–several shortly peduncled spreading or adpressed false spikes, up to 15 cm. long, finally well-exserted; axis subterete to angular; branches short, almost sessile, scaberulous, branched from the base; pedicels scaberulous, angular, very short. *Spikelets* pallid or somewhat greenish-purple, densely congested. *Glumes* unequal, subhyaline; the lower lanceolate, scaberulous on the keel, often minutely so on the flanks

upwards, up to 8 mm. long, passing into the 1 mm. long scaberulous awn; the upper up to 10 mm. long, glabrous, scaberulous on the keel upwards, passing into the short awn. *Lemma* tubulous, up to 10 mm. long including the callus and the column, distinctly scabrous upwards; *callus* 1 mm. long, densely bearded; column of awns up to 5 mm. long, twisted; awns somewhat unequal, spreading, fine, scabrous, up to 20 mm. long or somewhat longer.

SOUTH WEST AFRICA.

Otjiwarongo, I. 1939, *Volk* 472 (D); do., I. 1939, *Volk* 843 (D); Omane, II. 1939, *Volk* 1144 (D); Ossa, IV. 1939, *Volk* 1541 (D); between Tsumeb and Nosib, IV. 1934, *Dinter* 7444 A (B, G, N); Grootfontein, IV. 1913, *Engler* 6230 (K); Waterberg, V. 1928, *Bradfield* 277 b. (N); between Hoffnungsfelde and Harris, I. 1916, *Pearson* 9542 (BH, K, S); between Haris and Aub, I. 1916, *Pearson* 9669 (BH, S); Okahandja, III. 1928, *Bradfield* 277 (N, T); Klein Karas, V. 1931, *Oertendahl* 236 (B); do., IV. 1931, *Oertendahl* 116 (N); Kuibis, V. 1909, *Range* 647 (B, N); Aris, *Range* 1270 (K, N); Kubub, II. 1885, *Schinz* 657 (Z); Warmbad, IV. 1890, *Wandres* 19 (Z); without precise locality: *Grossarth* 42 (B) et *Blank* 39 (B).

CAPE PROVINCE.

Gordonia distr.: Upington, IX. 1919, *Shantz* 185 (W) et 182 (W); do., IV. 1928, *Pole Evans* 2173 (N). Kenhart distr.: Louisvale, II. 1930, *Mennell* s.n. (W). Little Namaqualand distr.: Springbokkuil, *Zeyher* 1818 (G, K, S, V); Dabeep, I. 1911, *Pearson* 6226 (K); Pella, I. 1909, *Pearson* 3590 (K). Fraserburg distr.: Williston, XI. 1921, *Foley* 187 (N). Cape distr.: Houtbay, VI. 1892, *Schlechter* 1015 (A, B, BH, V, Z). Prince Albert distr.: Fraserburg Road, I. 1903, *Marloth* 3054 (N). Uitenhage distr.: Steenbokvlakte, *Ecklon* (et *Zeyher*) s.n. (A, B, N, S); Uitenhage, IV. 1893, *Schlechter* 2458 (A, BH, BM, G, K, Z); Brakkloof, III. 1901, *White* 3 (A, B, V); Kariaga, I. 1904, *White* 108 (A). Somerset East distr.: Somerset East, VIII. 1871, *McOwan* 1788 (A, BM, S); do., *Bowker* 134 (K) et 148 (K). Queenstown distr.: Shiloh, *Baur* 55 (K). Klaas Smit's Bridge, III. 1928, *Galpin* 2355 (A). East London distr.: East London, III. 1917, *Wood* TM. 23228 (T). Komgha distr.: Along Kei River, III. 1894, *Flanagan* 2317 (A, BH, K, N). Xalanga distr.: Cala, *Pegler* 1708 (K). Wodehouse distr.: Indwe, *Baur* 71 (K). Aliwal North distr.: Aliwal North, *Stephanie* 15080 (BH). Albert distr.: *Cooper* 778 pro parte (K, N). Cradock distr.: Cradock, IX. 1919, *Shantz* 151 (W). Graaff-Reinet distr.: Graaff-Reinet, XI. 1866, *Bolus* 550 (A); do., III. 1868, *Bolus* 679 (BH, D, K, V); do., III. 1930, *Galpin* 10588 (N). Middelburg distr.: Middelburg, IV. 1922, *Gill* 43 (A, N, W). Victoria West distr.: Nobelsfontein, II. 1931, *Thorne* SAM. 49454 (S). Colesberg distr.: Colesberg, *Drège* 4349 (B, BM, G, K, V); do., *Shaw* 16 (K, V). Philipstown distr.: Potfontein, III. 1933, *Schweickerdt* 1204 (N); Petrusville, II. 1934, *du Plessis* in Hb. Stell. 19713 (St). Britstown distr.: Giesen's Kraal, III. 1917, *Wilman* s.n. (BH). Prieska distr.: Between Modderfontein and Keikam's Poort, IX. 1811, *Burchell* 1612-5 (K); Prieska, III. 1931, *Bryant* 605 (B, K, W). Hay distr.: Between Griquatown and Wittewater, II. 1812, *Burchell* 1983 (K); between Kloof Village and Wittewater, *Burchell* 2084 (K); near Postmasburg, VI. 1929, *Uys* G. 18 (N). Herbert distr.: Douglas, III. 1898, *Orpen* 254 (K). Kimberley distr.: Modderriver, II. 1894, *Kuntze* s.n. (B, K); Kimberley, *Rehmann* 3472 (B) et 3475 (B); do., *Moran* BH. 13910 (BH); do., IV. 1914, *Wilman* 688 (Mc); do., VII. 1919, *Shantz* 198 (K, W). Barkly West distr.: Waldeck's Plant, V. 1936, *Cooke* 3533 (Mc); Madipelessa, II. 1937, *Acock* 1825 (B, K, L, V, Z). Vryburg distr.: Armoedsvlakte, *Theiler* H. 19218 (N) et H. 20195 (N); Vryburg, I. 1923, *Kaplan* TM. 26077 (T). Mafeking distr.: Mafeking, X. 1919, *Shantz* 233 (K, W) et 236 (K, W); do., IV. 1929, *Pole Evans* 3061 (N). Kuruman distr.: Kuruman, II. 1886, *Marloth* 996 (B, W); do., III. 1928, *Pole Evans* 2063 (B, BM, N); do., I. 1929, *Dedman* in Hb. Stell. 10054 (St). Without precise locality: *Lichtenstein* (B); *Shantz* 209 (K, W).

NATAL PROVINCE.

Estcourt distr.: Winterton, I. 1933, *King* 389 (N). Dundee distr.: VII. 1899, *Green* 39 (D). Without precise locality: *Buchanan* 124 (K).

BASUTOLAND.

Mafeteng distr. : Likhoele, XI. 1914, *Dieterlen* 1069 (N, P). Leribe distr. : Leribe, *Buchanan* 149 (K); do., *Dieterlen* 383 (B, D, K, N, P, W); do., *Phillips* 655 (S) et 898 (K, S); Maluti mountains, XII. 1937, *Staples* 142 (N).

ORANGE FREE STATE.

Fauresmith distr. : Fauresmith, V. 1927, *Smith* 3984 (K) et I. 1928, *Smith* 5241 (K). Edenburg distr. : Trompsburg, *Potts* 4539 (GU, N). Bloemfontein distr. : Besters, XII. 1911, *Burt Davy* 11789 (N); Bloemfontein, II. 1915, *Potts* 1904 (D, K); do., XII. 1933, *Tidmarsh* 4923-4925 (K); do., *Snoek* 4927 (GU) et 4928 (GU); Brandfort, XII. 1934, *Schonken* in Hb. Stell. 23305 (St). Boshof distr. : Beth-el-Pella, *Wolff* 10 (N). Winburg distr. : Steynskloof, II. 1928, *de Wet* 4570 (GU). Ficksburg distr. : Rivenhill Farm, I. 1927, *Potts* 3676 (N, GU) et 3724 (N, GU). Fouriesburg, *Dixon* 4591 (GU). Senekal distr. : Doornkop, XII. 1931, *Goossens* 870 (N, K, W) et 933 (N, K, W). Ferrara, XII. 1931, *Goossens* 1004 (K, N). Bethlehem distr. : Bethlehem, X. 1901, *Richardson* (K, W). Hoopstad distr. : Wesselsbron, I. 1933, *Goossens* 1249 (N). Kroonstad distr. : Kroonstad, XI. 1928, *Pont* 96 (N) et 97 (GU); do., XII. 1933, *Laubscher* 4926 (GU); Bothaville, I. 1933, *Goossens* 1174 (B, N) et 1178 (N); do., IV. 1931, *Boshoff* 2 (N); do., III. 1933, *Schweickerdt* 1088 (N). Vredefort distr. : Viljoensdrift, I. 1912, *Rogers* 4819 (T). Heilbron distr. : Heilbron, I. 1934, *Goossens* 425 (N). Without precise locality : *Buchanan* 58 (B) et 59 (B) et 276 (B); *Rehmann* 3668 (A, Z).

TRANSVAAL PROVINCE.

Bloemhof distr. : Christiana, II. 1904, *Burt Davy* 1654 (N); Kameelpan, I. 1934, *Theron* 549 (N); Fourteen Streams, II. 1904, *Burt Davy* 1577 (N). Wolmaransstad, XII. 1928, *Sutton* 69 (N). Lichtenburg distr. : Grasfontein, V. 1930, *Sutton* 425 (N). Potchefstroom distr. : Potchefstroom, II. 1927, *Lane* 15 (N, W) et 17 (N). Vereeniging distr. : Vereeniging, II. 1917, *Burt Davy* 17162 (BH, K). Standerton distr. : Standerton, III. 1918, *Stent* H. 21833 (N). Ermelo distr. : Ermelo, XII. 1926, *Henrici* 1361 (N, W); do., II. 1936, *Norval* 136 (N); Lake Chrissie, IV. 1910, *Hamilton* H. 5914 (N). Barberton distr. : Barberton, XII. 1916, *Pott* 5527 (T); do., I. 1931, *Matthews* 8 (N). Middelburg distr. : Middelburg, III. 1910, *Hewitt* s.n. (T). Johannesburg distr. : Johannesburg, V. 1919, *Bryant* D. 47 (N, W); do., XII. 1908, *Leendertz* 1837 (T); do., III. 1919, *Moss* 3810 (W, WR); do., I. 1915, *Edwards* s.n. (A, BH, K); do., III. 1937, *Lintner* 28130 (D, K); do., VII. 1929, *Hitchcock* 24102 (S). Germiston distr. : Germiston, I. 1913, *Fenn* H. 8703 (N). Pretoria distr. : Pretoria, *Nelson* 64 (K); do., III. 1920, *Skea* 68 (N); do., I. 1930, *Obermeijer* 29140 (T); do., I. 1926, *Smith* 2285 (N); Premier Mine, II. 1921, *Menzies* 6 (N); Elandsrivier, *Rehmann* 4999 (B, K); Pienaars River, I. 1894, *Schlechter* 4140 (A, B, BH, BM, G, K, N, P, T, V, Z). Rustenburg distr. : Rustenburg, III. 1910, *Burt Davy* 9302 (N). Waterberg distr. : Warmbaths, I. 1936, *Irvine* 19 (N) et 19 a (N); Twenty-four Rivers, I. 1916, *Rogers* 24908 (WR); Naboomspruit, II. 1919, *Galpin* M. 421 (N); Potgietersrust, I. 1909, *Leendertz* 1990 (T); Crecy, *Carver* 11 (N). Pietersburg distr. : Shilouvane, *Junod* 2155 (G). Zoutpansberg distr. : Zoutpansberg, V. 1905, *Junod* H. 4662 (N). Lydenburg distr. : Lydenburg, *Atherstone* s.n. (A, K, S); do., XII. 1893, *Schlechter* 3961 (BM, T); Zwagershoek, I. 1930, *Obermeijer* 377 (T).

BECHUANALAND PROTECTORATE.

Gaberones, IV. 1928, *Nobbs* 11 (U); Metsematluko, IV. 1928, *Nobbs* 34 (U); Mochudi, V. 1914, *Harbor* 21789 (BH).

PORTUGUESE EAST AFRICA.

Lourenco Marques, VII. 1922, *Moss* 6906 (WR).

TYPE SPECIMEN.

There are four sheets collected by *Lichtenstein* which are deposited in the Botanisches Museum, Berlin-Dahlem. The original labels on the sheets say "*Aristida coarctata*".

The specimens are overmature. There is another sheet in the Willdenow Herbarium, Berlin, which is an excellent match of Lichtenstein's gatherings. Although this sheet does not state the collector, it bears the name "*A. coarctata* Licht." and from its perfect match I do not hesitate to say that it is part of the original gathering. This sheet has been named up by Henrard as *A. congesta* Roem. et Schult.

The above-mentioned five sheets undoubtedly represent the type gathering, and the part of this in the Willd. Herbarium has actually been studied by Henrard.

COMMON NAMES.

Buffalo grass. Duin-steekgras. Klossaad. Rotstert-steekgras. Steekgras.

ECONOMIC NOTES.

This species is considered to be poor grazing, but quite a good hay if it is cut early. When mature it is a pest to the sheep farmer and is supposed to have no fodder value to speak of. It is, however, an important annual in overgrazed and tramped-out areas. In the wilted condition this species has been found to contain large amounts of prussic acid.

REMARKS.

Examination of Lichtenstein's gatherings and the type of *A. barbicollis* has revealed the fact that the auricles of the leaves are bearded. Owing to the overmature condition of the Lichtenstein specimens most of the hairs have disappeared, and it is only on some leaves that the beards are still present. Stapf in Dyer, Fl. Cap. 7. 552 (1899) has used the presence or absence of the bearded auricles as a key-character to distinguish between *A. barbicollis* and *A. congesta*. Although some specimens actually have glabrous auricles, this character does not appear to be coupled with the contracted inflorescence. I have seen several specimens with open panicles typical of *A. barbicollis* in which the auricles are perfectly glabrous. This distinguishing character must thus be discarded as it is of no taxonomic value. In my opinion the shape of the panicle, viz., contracted, or lax and open, appears to be the only character upon which the two species in question may be distinguished. There are, however, many intermediates which can only be named arbitrarily. Having furthermore examined a fair number of "dwarfed specimens" I have come to the conclusion that *A. Rangei* is most probably nothing else but a first year flowering condition of *A. congesta*. Field study and breeding experiments will probably support the opinion expressed above.

52. *A. spectabilis* Hack. in Bull. Herb. Boiss. 3. VIII. 380 (1895); Stapf in Dyer, Fl. Cap. 7. 562 (1899); Stent in Bothalia 1. IV. 278 (1924); Henrard Crit. Rev. 3. 577 (1928); Henrard Monogr. 1. 93 cum ic. tab. 25 (1929); Theron in Fedde, Rep. 40. 26 (1936).

Densely caespitose rather robust *perennial*. Culms erect, stout, up to 1.5 m. high, simple, terete, sheathed nearly all along. Sheaths exceeding the internodes, glabrous, smooth, often with a flake of wool at the mouth and from there somewhat woolly along the margins downwards, the upper inconspicuously striate; auricles of lowermost sheaths usually bearded, those of the uppermost sheaths usually glabrous. Leaf-blades linear, involute, firm, tapering to a setaceous apex, smooth on the lower surface, prominently nerved and minutely scaberulous on the upper surface, up to 60 cm. long, 4-5 mm. wide at the base, somewhat glaucous. Panicle oblong to ovate, lax and open, nodding, 30-40 cm. long, the axis smooth, with distant binate or solitary branches up to 20 cm. long, which in turn are again branched from near their base, the secondary, tertiary, etc., branchlets and pedicels minutely scaberulous, the latter as long as or much longer than the glumes. Spikelets glabrous, yellowish or greenish. Glumes linear-lanceolate, acute, rather firm, with hyaline erosely dentate tips and narrow margins, 1-nerved, smooth, subequal, about 10-12 mm. long. Lemma linear, about 6.5-7.5 mm. long inclusive of the callus, smooth or dorsally

minutely scaberulous upwards. *Callus* up to 1 mm. long, densely bearded, bifid. Column of awns strongly twisted, nearly glabrous, 5–6 mm. long; awns scaberulous, erect or spreading, unequal, the central up to 44 mm. long, the lateral awns up to 28 mm. long. *Anthems* 5 mm. long.

TRANSVAAL PROVINCE.

Potchefstroom distr.: Oudeplaats, IV. 1937, *Bunting* 156 (N) et 161 (N). Krugersdorp distr.: Hekpoort, III. 1937, *Bunting* 126 (N) et 145 (N). Pretoria distr.: Kuduspoort, *Rehmann* 4695 (B, V, Z): Saartjiesnek off Pelindaba Road, III. 1939, *Schweickerdt* 1333–1341 (B, K, N, W, V). Brits distr.: Jackson's Tuin, III. 1934, *Mogg* 14985 (N).

BECHUANALAND PROTECTORATE.

Kanye, III. 1937, *Bunting* 133 (N).

TYPE SPECIMEN.

Rehmann 4695 in the Botanisches Museum, Zürich, and the Naturhistorisches Museum, Wien are both in Hackel's own hand and thus together constitute the type.

ECONOMIC NOTES.

Owing to the very wiry nature of the culms and the stiff leaves, this species is unpalatable.

REMARKS.

The author of the present paper has repeatedly searched for this species at the type locality, Koedoespoort, near Silverton, but so far has not been successful in finding it in that locality. The species, however, is comparatively frequent but local in some parts of the Pretoria district and a wide series of specimens has recently been collected. The plants usually occur in large dense tussocks in sandy depressions on the northern slopes of the Magaliesberg. They are readily recognisable by their strictly erect habit and the half-nodding panicles which give them a very characteristic appearance. The plant may easily be confused with *A. diffusa* Trin. var. *Burkei*, but differs from this variety by having subequal glumes, the tips of which are hyaline.

53. *A. stipoides* Lam. Encycl. Method. 157 (1791); Henrard Crit. Rev. 3. 591 (1928); Henrard Monogr. 1. 93 cum ic. tab. 26 (1929).

A. stipoides Lam. var. *meridionalis* Stapf sec. Garabedian in Ann. S. Afr. Mus. 16. II. 405 (1925) pro parte, non Stapf. *A. gracillima* Oliv. in Trans. Linn. Soc. 29. 173 (1875) cum ic. 114 fig. 1; Dur. et Schinz, Consp. 5. 803 (1895); Hack. in Bull. Herb. Boiss. 4. Append. III. 18 (1896).

Robust *perennial*, loosely tufted. *Culms* simple or branched from the upper nodes, up to 100 cm. high; internodes glabrous, slightly striate; nodes glabrous, exserted. *Leaf-sheaths* shorter than the internodes, glabrous, striate; *ligule* a short ciliate rim; auricles woolly; *blades* narrow, flat or involute, up to 20 cm. long, 3–4 mm. wide, smooth on the lower surface, striate and scaberulous on the upper surface. *Panicle* effuse, very lax and open, up to 30 cm. long, scantily flowered; branches bi- or tri-nate, glabrous or scaberulous; pedicels capillary, flexuous or curved or straight, scaberulous, with subclavate tips. *Glumes* pallid, or tinged with purple especially at the base, very unequal, glabrous; the lower up to 7 mm. long, ovate-lanceolate; the upper narrowly linear, 15–20 mm. long, mucronate from a bifid apex. *Lemma* terete, including the callus up to 9 mm. long, smooth but punctulate upwards; *callus* slender, about 2 mm. long, bifid, densely hairy; column of awns scabrous, twisted, 2.5–3 cm. long; awns subequal, scabrous, up to 5.5 cm. long.

SOUTH WEST AFRICA.

Olukonda, II. 1886, *Schinz* 671 (Z); Onolongo, *Barnard* 42 (S); Mafa, *Barnard* 815 (S).

TYPE SPECIMEN.

The type is deposited in the Lamark Herbarium, Museum d'Histoire Naturelle, Paris.

54. *A. vestita* Thunb. Prodr. 19 (1794); Thunb. Fl. Cap. 1. 394 (1813); Thunb. Fl. Cap., ed. Schult. 104 (1823); Hack. in Engl. Bot. Jahrb. XI. 400 (1889); Dur. et Schinz, Consp. 5. 810 (1894) excl. syn. pro parte; Stapf in Dyer, Fl. Cap. 7. 561 (1899) pro parte et excl. syn. pro parte; F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915) pro parte; Phillips in Ann. S. Afr. Mus. 16. 347 (1917); Stent in Bothalia 1. IV. 278 (1924) pro parte; Henrard Crit. Rev. 3. 663 (1928); Henrard Monogr. 1. 94 cum ic. tab. 27 (1929). *A. vestita* Thunb. forma amplior Hack. in Engl. Bot. Jahrb. 11. 400 (1889); Henrard Crit. Rev. 3. 664 (1928). *A. diffusa* Trin. sec. Steud. Syn. Pl. Glum. 1. 142 (1854) pro parte, non Trin. *A. flocciculmis* Mez in Fedde, Rep. 17. 147 (1921); Henrard Crit. Rev. 1. 182 (1926). *A. lanuginosa* Burchell, Travels 2. 226 (1824); Henrard Crit. Rev. 287 (1926). *Chaetaria vestita* (Thunb.) Beauv. Agrostogr. 30 et 152 et 158 (1812); Roem. et Schult. Syst. Veg. 2. 392 (1817).

Perennial, robust, densely caespitose, up to 85 cm. high, branched from the base only, often also from some of the culm-nodes. *Culms* about 3-4-noded, erect, rigid, not rarely somewhat wiry; internodes up to 25 cm. long, exserted, the lower densely (sometimes scantily) adpressedly woolly, the upper villous or at length becoming glabrous; nodes glabrous. *Lower leaf-sheaths* broad and papery, straw-coloured and somewhat brittle, adpressedly lanate dorsally and along the margins, eventually becoming glabrous, striate, shorter than the internodes; *ligule* a short ciliate rim, passing into a flake of wool at the auricles; *blades* linear, up to 24 cm. long and 3 mm. wide, either flat or more usually convolute, striate, lower surface glabrous, scabrous, shortly hairy on the upper surface, apex subpungent. *Panicle* pyramidal to subpyramidal, more or less effuse or laxly contracted, up to 20 cm. long and 12 cm. wide; axis striate, glabrous or with scattered white hairs, axillary beards present or absent; rhachis of the inflorescence usually scabrous upwards; branches suberect or more usually spreading, scabrous; pedicels longer or shorter than the glumes, scabrous, subclavate at the tips. *Spikelets* pallid or light-brown owing to the colour of the glumes. *Glumes* glabrous, 1-nerved; the lower broadly lanceolate, 4.5 to 7 mm. long, rounded and ciliolate at the tip; the upper glume narrowly-lanceolate, slightly emarginate, 9-13 mm. long. *Lemma* glabrous, 7-11 mm. long from base of callus to articulation, usually mottled; *callus* up to 1.5 mm. long; column variable in length, 2-7 mm. long, strongly twisted; awns unequal, spreading, the central up to 35 mm. long, the lateral however much shorter.

SOUTH WEST AFRICA.

Schakalskuppe, II. 1909, *Pearson* 4801 (BH, K).

CAPE PROVINCE.

Gordonia distr.: Upington, IV. 1928, *Pole Evans* 2182 (N). Hay distr.: Griquatown, XII. 1811, *Burchell* 1917 (K); do., XII. 1811, *Burchell* 1842 (K, P); do., *Wilman* s.n. (K, Mc, N); Niekerk's Hope, X. 1936, *Lindeberg* 1331 (Mc); Kloof Village, Asbestos Mts.. II. 1812, *Burchell* 2038 (K); Rüdesheim, IV. 1920, *Louw* 2670 (Mc). Kuruman distr.: Kuruman, III. 1928, *Pole Evans* 2097 (N); do., I. 1929, *Dedman* in Hb. Stell. 10049 (St). Barkly West distr.: Barkly West, IV. 1929, *Herram* 10 (N); Newlands, *Paton* 691 (Mc). Kimberley distr.: Warrenton, II. 1926, *Smith* 2347 (N); do., III. 1920, *Adams* 2671 (BH); Kimberley, I. 1886, *Marloth* 940 (B, W) et 847 (B, V, W). Mauritzfontein, I. 1934, *Pocock* s.n. (U); du Toits Pan, *Tuck* SAM. 19406 (S); Modderivier, II. 1894, *Kuntze* s.n. (B). Herbert distr.: Honeynestkloof, III. 1920, *Wilman* 2537 (K, Mc, U) et 1297 (K, Mc). Hopetown distr.: Hopetown, *Rehmann* 3294 (V). Hanover distr.: Hanover, I. 1902, *Galpin* 6260 (N). Prieska distr.: Prieska, *Bryant* 611 (B, K, W).

ORANGE FREE STATE.

Fauresmith distr.: Fauresmith, I. 1928, *Smith* 5242 (N). Bloemfontein distr.: Bloemfontein, *Tidmarsh* 4936-4939 (GU); Bestersput, *Wetti* 183 (Z). Boshof distr.: Boshof, IV. 1931, *Wolff* 17 (N). Wepener distr.: Wepener, XII. 1934, *Schonken* in Hb. Stell. 23330 (St).

TRANSVAAL PROVINCE.

Bloemhof distr.: Bloemhof, *Burtl Davy* 13030 (N); Kameelpan, I. 1934, *Theron* 599 (N).

WITHOUT PRECISE LOCALITY.

Burke et Zeyher 1810 (O).

TYPE SPECIMEN.

Thunberg's gathering is deposited in the Thunberg Herbarium, Upsala.

COMMON NAMES.

Beesgras. Bushmangrass. Hardegras. Teesukergras.

ECONOMIC NOTES.

This species prefers shallow rocky soil where it is often abundant. It stands drought well but is of little value as a fodder.

REMARKS.

Buchanan 124 (BH, K) from Leribe, *Burtl Davy* 9375 (N) from Ermelo, and *Atherstone* s.n. from near Lydenburg also belong to this species, but I very much doubt whether the localities indicated by these gatherings are correct.

Gatherings such as *Burchell* 1842 and *Wolff* 17 differ from typical *A. vestita* in that their culms are somewhat fascicled. This give them an appearance akin to species such as *A. Engleri* and *A. dasylesmis*. They may however be distinguished from the latter species by the adpressedly woolly internodes.

55. *A. meridionalis* *Henrard* Crit. Rev. 2. 344 (1927); *Henrard* Monogr. 1. 95 cum ic. tab. 27 (1929); *Obermeijer*, *Schweickerdt et Verdoorn* in *Bothalia* 3. II. 227 (1937).

A. stipoides Lam. sec. *Stent* in *Bothalia* 1. IV. 278 (1924), non Lam. *A. stipoides* Lam. var. *meridionalis* *Stapf* in *Dyer*, Fl. Cap. 7. 562 (1899); *Dinter* in *Fedde*, Rep. 15. 342 (1918); *Henrard* Crit. Rev. 3. 592 (1928).

Perennial, compactly caespitose. *Culms* erect, simple or somewhat branched, up to 2 m. high, 2-3-noded; internodes glabrous, striate, fairly thick in robust specimens: nodes usually dark in colour, glabrous, exserted. *Leaf-sheaths* striate; the lower usually densely woolly especially those of the innovations; the upper usually glabrous and smooth; *ligule* a short ciliolate rim; auricles with a dense flake of wool, long hairy; collar glabrous; *blades* narrow, usually involute, up to 50 cm. long and 5 mm. wide, striate and glabrous on the lower surface, scabrous on the upper surface. *Panicle* large, very lax and effuse, up to 50 cm. long and over 20 cm. wide, many-flowered; rhachis smooth; branches 2-3-nate, repeatedly branched, smooth or scaberulous; pedicels capillary, flexuous, scaberulous, with sub-clavate tips, shorter to much longer than the glumes. *Glumes* unequal, glabrous; the lower 5-7 mm. long; the upper 10-15 mm. long. *Lemmas* terete, 7-9 mm. long, mottled with purple, smooth or slightly punctulate, scaberulous upwards; *callus* 1.5-2 mm. long, slender, densely hairy, bifid; column of awns slender, twisted, up to 2 cm. long; awns subequal, up to 5 cm. long.

SOUTH WEST AFRICA.

Ondonga, IV. 1905, *Rautanen* 588 (Z) et 9 (K, V); Tsumeb, I. 1912, *Dinter* 2476 (L); Grootfontein, IV. 1913, *Engler* 6235 (K); Otjiwarongo, III. 1928, *Bradfield* 288 a (N) et V. 1928, *Bradfield* 288 (N); Awas mountains, I. 1916, *Pearson* 9661 (BH, K, S, W); Namutoni to Tsinabis, VIII. 1919, *Pole Evans* H. 19378 (N); Runtu, V. 1939, *Volk* 1716 (D); Nudsas, anno 1939, *Volk* A. 152 (D); Okos, III. 1939, *Volk* 970 (D); Small Waterberg, XII. 1939, *Volk* 565 (D); Asisport, anno 1939, *Volk* A. 2 (D).

WITHOUT PRECISE LOCALITY.

Dinter 3271 (B); *Empire Exhibition* 28 (B, BH, BM, K, P, S, W, Z); *Seiner* 453 (W); *Nels* s.n. (Z); *Boss* TM. 36214 (T).

CAPE PROVINCE.

Hay distr.: Dunmurray, II. 1923, *Wilman* 2215 (Mc) et VII. 1923, *Coote* 2521 (Mc). Herbert distr.: Honeyestkloof, *Rehmann* 3386 (BM, K, Z). Kimberley distr.: Kimberley, IX. 1919, *Shantz* 202 (W); Picardi, III. 1937, *Wilman* 4091 (Mc, K, N); Modderivier, II. 1894, *Kuntze* s.n. (K). Barkly West distr.: Barkly West, II. 1921, *Wilman* 2142 (Mc). Kuruman distr.: Kuruman, III. 1928, *Pole Evans* 2064 (K, N); do., I. 1929, *Dedman* in Hb. Stell. 10057 (St); between Kuruman and Matlareen River, VII. 1812, *Burchell* 2188 (K); near Dikgatlon, III. 1928, *Pole Evans* 2054 (N). Taungs distr.: Taungs, IX. 1917, *Pole Evans* H. 15834 (N). Vryburg distr.: Vryburg, V. 1912, *Burt Davy* 13726 (N) et 14018 (N); Armoedsvlakte, IV. 1912, *Sharpe* H. 7445 (N); do., VIII. 1920, *Theiler* NH. 20244 (N); do., III. 1924, *Henrici* 92 (N); do., *Stent* H. 21505 (N) et IV. 1912, *Rogers* 21796 (BH). Mafeking distr.: Mafeking, IV. 1929, *Pole Evans* 2390 (N) et 2440 (K, N).

ORANGE FREE STATE.

Boshof distr.: Beth-el-Pella, IV. 1931, *Wolff* 25 (N). Bloemfontein distr.: Bloemfontein, V. 1909, *Potts* 5139 (N); do., *Pont* 1152 (Z) et 1153 (Z); between Kimberley and Bloemfontein, II. 1877, *Buchanan* 281 (BH, K, S).

WITHOUT PRECISE LOCALITY.

Buchanan 56 (K, D) et 68 (K, D).

TRANSVAAL PROVINCE.

Pretoria distr.: Pretoria, IX. 1930, *Goossens* 115 (N); do., III. 1929, *Skea* 54 (N); do., I. 1922, *Gower* 19 (N); Lichtenburg distr.: Enselberg Camp, V. 1928, *Pole Evans* 2212 (N); Waterberg distr.: Potgietersrust, III. 1921, *Galpin* 8890 (K, N, W); Zoutpansberg distr.: Zoutpan, IV. 1934, *Schweickerdt et Verdoorn* 604 (N).

BECHUANALAND PROTECTORATE.

Makarikari Lake, IV. 1931, *Pole Evans* 3275 (K, N); Nkate, IV. 1931, *Pole Evans* 3297 (N) et 3307 (N, K); between Kaotwe and Malopo, IV. 1928, *Nobbs* 73 (U); 30 miles south of Cwising Pan, VI. 1937, *Pole Evans* 4026 (N); between Naga Tatollo and Henry's Pan, *Holub* s.n. (K); Gaberones, III. 1930, *Van Son* TM. 28626 (N, T); do., IV. 1928, *Nobbs* 12 (U); Bakhatla Reserve, IV. 1931, *Pole Evans* 3157 (K, N).

TYPE SPECIMEN.

Dinter 2476 is deposited in the Rijksherbarium, Leiden.

COMMON NAMES.

Haygrass. Klossaad.

ECONOMIC NOTES.

This species is said to be used as a hay-grass during bad seasons. Owing to its coarseness it is not readily eaten by stock.

REMARKS.

Henrard in Crit. Rev. 1. 345 (1927) states that the species was described by Dr. Stapf as a variety of *Aristida stipoides* in Flora Capensis Vol. 7. p. 562 Henrard, however, has selected *Dinter* 2476 in Herb. Leiden as the type and does not use the double citation for his species. It is therefore obvious that he has not based his species on Stapf's variety and that the use of the same epithet "*meridionalis*" does not indicate the raising of the variety to specific rank. It is a pity that Henrard did not select a different epithet to designate his species; it would have precluded any doubt as to whether he has based his species on Stapf's variety or not.

56. *A. dasydesmis* Mez in Fedde, Rep. 17. 143 (1921); Henrard Crit. Rev. 1. 131 (1926); Henrard Monogr. 1. 95 cum ic. tab. 26 (1929); Theron in Fedde, Rep. 40. 23 (1936).

A. angustata Stapf sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915), non Stapf. *A. vestita* Thunb. sec. Steud. Syn. Pl. Glum. 1. 142 (1854) pro parte; F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915) pro parte, non Thunb. *A. vestita* Thunb. var. *parviflora* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. 3. 747 (1852); Stapf in Dyer, Fl. Cap. 7. 561 (1899); F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915); Henrard Crit. Rev. 3. 668 (1928). *Arrhatherum vestitum* (Thunb.) Nees, Fl. Afr. Austr. 174 (1841); Drège, Zwei Pflanzengeogr. Doc. 90 (1843), non *Aristida vestita* Thunb.

Perennial, caespitose. *Culms* many-noded, erect, much-branched from the lower nodes, the fascicled branches culm-bearing, giving the whole plant a very characteristic appearance, glabrous. *Leaf-sheaths* glabrous, the lower soon deciduous, the upper at length slipping from the culms; *ligule* a ciliate rim; auricles minutely pubescent; *blades* more or less erect and stiff, smooth and subpungent, involute, about 1 mm. wide. *Panicle* somewhat contracted, at times fairly dense, up to 10 cm. long and 3 cm. wide; branches binate, the upper usually simple, adpressed to the rhachis; branchlets and pedicels slightly scaberulous; the latter shorter than or as long as the glumes. *Glumes* unequal, glabrous; the lower about 5 mm. long, the upper up to 8 mm. long. *Lemma* tubulose, glabrous, including the callus up to 8 mm. long; *callus* 1 mm. long, bearded, truncate, obliquely truncate, rounded or slightly emarginate; column of awns twisted, about 5 mm. long; awns slightly unequal, the central up to 25 mm. long, the lateral up to 20 mm. long.

CAPE PROVINCE.

Little Namaqualand distr.: Iaus, IX. 1897, *Schlechter* 11228 (A, B, K, N); Ratel Poort, XII. 1909, *Pearson* 2952 (A, BM, K, N, S); Zilverfontein, Drège (B, BM, G, K, LG, N, O, P, S, V); Rietfontein, XII. 1908, *Pearson* 3768 (BH, K); Rietkloof mountain, II. 1910, *Pearson* 5719 (BH, K); Alewynfontein, XII. 1908, *Pearson* 3487 (A, BH, BM, D, K, N, S); Kweekfontein, I. 1909, *Pearson* 3803 (A, BM, S). Aberdeen distr.: Camdeboosberg, Drège s.n. (LG). Gordonias distr.: Twinkoppies, III. 1937, *Acock* 2053 (K).

TYPE SPECIMEN.

Schlechter 11228 is deposited in the Botanisches Museum, Berlin-Dahlem.

REMARKS.

The articulation at the apex of the lemma is not always well-developed, in fact *Pearson* 3487 shows the presence of lemmas which are very inconspicuously articulated. As the specimens constituting this gathering are over-mature, the normally developed lemmas have probably already been shed and only the imperfectly developed lemmas have not yet disarticulated.

57. *A. Engleri* Mez in Fedde, Rep. 17. 147 (1921); Garabedian in Ann. S. Afr. Mus. 16. II. 402 (1925); Henrard Crit. Rev. 1. 170 (1926); Henrard Monogr. 1. 96 cum ic. tab. 29 (1929); Range in Fedde, Rep. 33. 8 (1933).

Aristida stipoides Lam. var. *meridionalis* Stapf sec. Garabedian in Ann. S. Afr. Mus. 16. II. 405 (1925) pro parte, non Stapf. *Aristida vestita* Thunb. sec. F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915) pro parte; Garabedian in Ann. S. Afr. Mus. 16. II. 406 (1925); Range in Fedde, Rep. 33. 10 (1933); omnes non Thunb.

The facies of this species so closely resembles that of *A. dasydesmis* Mez that unless the spikelets are dissected these two species are not to be distinguished with any degree of certainty. *A. Engleri* has a lemma which is dorsally distinctly scaberulous, furthermore the callus is distinctly bifid whereas in *A. dasydesmis* the callus is truncate or slightly emarginate and the lemma is dorsally glabrous.

SOUTH WEST AFRICA.

Gründoorn, II. 1909, *Pearson* 4554 (A, BH, BM, D, K, N, S); Bethanie, IV. 1911, *Range* 1013 (B); Aus, III. 1929, *Dinter* 6128 (B, BH, K); do., X. 1922, *Dinter* 4161 (Z);

Kuibis, *Engler* 6717 (B); do., *Range* 891 (871?) (B); Akam River, II. 1909, *Pearson* 4765 (BH, BM, K, S); Sandverhaar, II. 1909, *Pearson* 4612 (A, D, K); Kleine Karasberge, V. 1931, *Oertendahl* 232 (B); Great Karasberg, I. 1913, *Pearson* 8495 (BH, BM, K, S); Naruda Süd, I. 1913, *Pearson* 8307 (A, BM, D, N, S); Noachabeb, *Blank* 38 (B); Kraaikluft, VI. 1931, *Oertendahl* 483 (B); Lord Hills, I. 1913, *Pearson* 8494 (A, BH, K, N); Dabaigabis, I. 1909, *Pearson* 4406 (BH, BM, K, S); Raman's Drift, I. 1909, *Pearson* 4533 (K).

CAPE PROVINCE.

Little Namaqualand distr.: Copperberg, X. 1926, *Pillans* 5648 (BH, K); Alewynsfontein, XII. 1908, *Pearson* 3487 (N). Hay distr.: Postmasburg, III. 1920, *Pole Evans* 72 (K); Dunmurray, III. 1920, *Pole Evans* 80 (K, N); do., II. 1923, *Wilman* 2216 (BH, K, Mc, N). Without precise locality, *Drège* s.n. (LG, O, P).

TYPE SPECIMEN.

Engler 6717 is deposited in the Botanisches Museum, Berlin-Dahlem.

ECONOMIC NOTES.

This species mainly grows in mountain gorges. It is eaten by horses and cattle. Considered a good fodder-grass.

58. *A. diffusa* Trin. var. *genuina* Henrard Monogr. 1. 97 (1929).

A. diffusa Trin. var. *densa* (Trin. et Rupr.) Henrard Crit. Rev. 3. 665 (1928); Henrard Monogr. 1. 97 (1929). *A. diffusa* Trin. var. *Eckloniana* (Trin. et Rupr.) Henrard Crit. Rev. 3. 666 (1928). Henrard Monogr. 1. 97 cum ic. tab. 29 (1929). *A. diffusa* Trin. var. *Schraderiana* (Trin. et Rupr.) Henrard Crit. Rev. 3. 668 (1928); Henrard Monogr. 1. 97 (1929). *A. Hystrix* Thunb. Prodr. 19 (1794), non Linn. fil. (1781); Henrard Crit. Rev. 2. 252 (1927). *A. vestita* Thunb. sec. Steud. Syn. Pl. Glum. 1. 142 (1854); F. Bolus in Ann. S. Afr. Mus. 9. IV. 232 (1915); sec. Stapf in Dyer, Fl. Cap. 7. 561 (1899) omnes pro parte, non Thunb. *A. vestita* Thunb. var. *densa* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. 3. 747 (1852); Henrard Crit. Rev. 3. 666 (1928). *A. vestita* Thunb. a *diffusa* (Trin.) Walp. Ann. Bot. 3. 747 (1852). *A. vestita* Thunb. var. *Eckloniana* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. 3. 747 (1852); Dur. et Schinz, Consp. 5. 810 (1894). *A. vestita* Thunb. var. *Schraderiana* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. 3. 747 (1852); Stapf in Dyer, Fl. Cap. 7. 561 (1899). *Chaetaria Hystrix* P. de Beauv. sec. Roem. et Schult. Syst. Veg. 2. 390 (1817) pro parte. *A. diffusa* Trin. Trin. Gran. Gen. in Mem. Acad. Imp. Sc. Petrop. Ser. 6. 1. 86 (1830); Kunth, Enum. 1. 193 (1833); Steud. Syn. Pl. Glum. 1. 142 (1854) pro parte. Henrard Crit. Rev. 1. 142 (1926); Henrard Monogr. 1. 96 cum ic. tab. 28 (1929).

Perennial, densely caespitose. *Culms* simple, erect, 1-2-noded, up to 75 cm. high, firm, glabrous and smooth; internodes terete; nodes exserted. *Leaf-sheaths* tight, glabrous or the lower covered with a fugacious woolly indumentum; *ligule* a ciliate rim; auricles pubescent; *blades* convolute, up to 30 cm. long, 2.5 mm. wide, curved or flexuous, lower surface smooth, upper surface scaberulous or hispidulous. *Panicle* effuse, up to 15 cm. long and nearly as broad; rachis straight or somewhat flexuous; branches at length spreading. *Spikelets* suberect or nodding, purple, purplish-brown or brown. *Glumes* unequal, glabrous; the lower obtuse, 4-10 mm. long; the upper up to 18 mm. long. *Lemma* including the callus up to 14 mm. long, almost smooth but usually dorsally scaberulous upwards; *callus* about 1 mm. long, distinctly bifid, densely bearded; column about 6 mm. long, twisted, scabrous; awns scaberulous, subequal, the central up to 35 mm. long, the lateral up to 30 mm. long.

CAPE PROVINCE.

Clanwilliam distr.: Het Kruis, IX. 1912, *Glover et Stephens* 14722 (BH); Boschklouf, *Drège* (891) (B, K, LG, N). Piquetberg distr.: Above Piekens Pass, XI. 1910, *Pillans* 5185 (K); Moutons Valley, XI. 1934, *Pillans* 7356 (BH). Malmesbury distr.: Hopefield, XI. 1885, *Bachmann* 871 (B, V, Z) et 872 (B, Z) et 677 (B). Ceres distr.: Elandskloof, XII. 1935, *Levyns* 5098 (U). Paarl distr.: Bains Kloof, XI. 1896, *Schlechter* 9138 (A, B, BH, BM, G, K, N, P, V, W, Z). Stellenbosch distr.: Stellenbosch, XII. 1915, *Bolus* 14921

(BH, D, K, T); do., XII. 1916, *Duthie* 88 (A, K, Sreg); Firgrove, X. 1929, *Sandwith* 154 (K). Cape distr.: Table Mountain, *Ecklon* 976 (B, G, K, N, O); Cape Town, *Harvey* 158 (K); do., *Prior* s.n. (K, S); do., VII. 1928, *Hitchcock* 24088 (K, N, W). Caledon distr.: Caledon, *de Villiers* 16 (N). Swellendam distr.: Between Breede Rivier and Zonder Einde Rivier, *Burchell* 7491 (K). Riversdale distr.: Riversdale, XI. 1892, *Schlechter* 1764 (A, B, G, K, Z); Oakdale, II. 1929, *Levy* 2714 (U) et 2873 (U). Prince Albert distr.: Tygerberg, V. 1907, *Marloth* 4452 b (N). Laingsburg distr.: Whitehill, XI. 1924, *Compton* 2928 (BH). Uitenhage distr.: Above Koega River, *Zeyher* 4505 (S). Zwartkopsriver, *Zeyher* 4504 (N, K, P, V); do., *Zeyher* 447 (A); between Koega and Sunday Rivers, *Drège* (B, N).

WITHOUT PRECISE LOCALITY.

Krauss s.n. (B); *Pickstone* 51 (B); *Bergius* 236 (B); *Boivin* (B). *Thunberg* (BM, LG); *Masson* (BM, G, P); *Carmichael* (BM); *Pappe* 9722 (BM); *Zeyher* 4405 (K).

TYPE SPECIMEN.

The type is deposited in the Trinius Herbarium, Leningrad. The sheet does not bear a collector's name or a number, but merely "*C. B. Sp., Thunberg mis. absq. nom.*" Trinius first named the sheet *A. diffusa* but later ? substituted the epithet "*vestita*".

58a. *A. diffusa* Trin. var. *Burkei* (Stapf) Schweickhardt in Notizbl. Bot. Garten u. Mus. Berlin-Dahlem 14. 122 p. 195 (1938).

A. Burkei Stapf in Dyer, Fl. Cap. 7. 557 (1899); Phillips in Ann. S. Afr. Mus. 16. 347 (1917) pro parte; Stent in Bothalia 1. IV. 277 (1924); Henrard Crit. Rev. 1. 64 (1926); Henrard Monogr. 2. 183 cum ic. tab. 81 (1932); Theron in Fedde, Rep. 40. 20 (1936); Potts et Tidmarsh in Journ. S. Afr. Bot. 3. II. 88 (1937). *A. vestita* Thunb. sec. Stapf in Dyer, Fl. Cap. 7. 561 (1899) pro parte; Medley Wood, Natal Plants 5. tab. 402 cum descr. (1905); Stent in Bothalia 1. IV. 278 (1924) pro parte, omnes non Thunb. *A. angustata* Stapf sec. Medley Wood, Natal Plants 2. tab. 198 cum descr. (1904), non Stapf.

Perennial, densely caespitose. *Culms* slender, erect, wiry, smooth, up to 75 cm. high, usually 3-more-noded; internodes, terete, glabrous; nodes glabrous. *Leaf-sheaths* firm and tight, glabrous, usually shorter than the internodes; *ligule* a line of short hairs; auricles and collar glabrous; *blades* setaceously convolute, curved or flexuous, up to 30 cm. long or longer, about 3 mm. wide near the base, lower surface striate and glabrous, upper surface scaberulous. *Panicle* up to 30 cm. long or more, diffuse and open, at times scantily developed and much smaller; rachis striate, smooth; branches 2-3-nate, up to 15 cm. long or longer, filiform, branched, smooth or scaberulous; branchlets capillary, flexuous; pedicels as long as or longer than the spikelets. *Spikelets* yellow-brown to pallid, nodding. *Glumes* unequal, glabrous; the lower up to 6 mm. long; the upper about 12 mm. long. *Lemmas* about 12 mm. long, smooth and glabrous, at times dorsally scaberulous upwards; *callus* bifid, bearded, about 1.0 mm. long; column 2-5 mm. long, twisted; awns somewhat unequal; the central up to 25 mm. long, the lateral up to 20 mm. long.

CAPE PROVINCE.

Ladismith distr.: Ladismith, VII. 1929, *Levy* 4199 (U). Prince Albert distr.: Prince Albert, XII. 1904, *Bolus* 11671 (BH, D, N); Fraserburg Road, I. 1923, *Marloth* 3058 (N); Zwartbulletje, *Drège* (K). Aberdeen Distr.: Aberdeen Road, IX. 1929, *Pole Evans* 2545 (N). Somerset East distr.: Somerset East, *McOwan* 1658 (A, U); Blyde River, V. 1813, *Burchell* 2978 (G, K). Albany distr.: Carlisle Bridge, V. 1921, *Bowker* 16 (A). Komgha distr.: Komgha, III. 1893, *Flanagan* 1780 (BH, N, S). Graaff-Reinet distr.: Graaff-Reinet, IV. 1866, *Bolus* 459 (A, BH, K). Cradock distr.: Mortimer, I. 1902, *Kensit* 21794 (BH). Middelburg distr.: Middelburg, IV. 1922, *Gill* 41 (A, N); do., *Selschop* H. 15163 (N); do., IV. 1911, *Pillans* 1846 (K); Middelburg Road Station, *Flanagan* 1644 (BH, N); Rosmead Junction, III. 1911, *Pillans* 1805 (K). Queenstown distr.: Queenstown, *Everett* 50 (N); Shiloh, *Baur* 964 (K); Fincham's Nek, IV. 1898, *Galpin* 2383 (A, K,

N, W). Wodehouse distr.: Indwe, XI. 1901, *Sim* 2758 (A). Albert distr.: Burghersdorp, *Cooper* 3372 (K). Aliwal North distr.: Aliwal North, *Sister Stephanie* 289 (A, BH); do., anno 1934, *Truter* 7 et 47 et 64 (omnes St). Barkly East distr.: Barkly East, II. 1934, *Greyvenstein* 13 (N). Colesberg distr.: Achteertang Station, V. 1930, *Bennett* 21401 (N). Aliwal North distr.: Eland's Hoek, I. 1904, *Bolus* 10506 (BH, N). Barkly West distr.: Barkly West, XII. 1893, *Bennie* 588 (A). Mafeking distr.: Bultfontein, IV. 1929, *Pole Evans* 2452 (N).

WITHOUT PRECISE LOCALITY.

Burke et Zeyher 1808 (O); *Zeyher* 1811 (K). Matatiele distr.: Matatiele, III. 1914, *Jacottet* 806 (Z).

NATAL PROVINCE.

Klip River distr.: Ladysmith, *Medley Wood* 9100 (D). Dundee distr.: near Dundee, III. 1899, *Medley Wood* 7449 (D) et 7450 (D, K). Zululand, II. 1899, *Jenkinson* 79 (BH, D, K). Coldstream, Drakensberg, *Rehmann* 6929 (V, Z).

BASUTOLAND.

Leribe distr.: Leribe, *Dieterlen* 199 a (B, D, K, N, P, S, Z); do., II. 1913, *Phillips* 948 (S). Maluti Mountains, *Staples* 29 et 131 (N). Cana, III. 1905, *Moreillon* 10 (Z).

WITHOUT PRECISE LOCALITY.

Dieterlen 199 (K, V).

ORANGE FREE STATE.

Fauresmith distr.: Fauresmith, V. 1927, *Smith* 3967 (K) et 4014 (K); do., VI. 1927, *Smith* 4168 (K); do., I. 1925, *Pole Evans* 1573 (N). Edenburg distr.: Trompsburg, I. 1925, *Potts* 4533 (GU, N). Bloemfontein distr.: Bloemfontein, II. 1929, *Tidmarsh* 4561 (GU); do., III. 1933, *Koller* 4922 (GU); do., *Kuntze* s.n. (K); do., *Potts* 2395 (B, K) et 2442 (B, K); Glen, III. 1926, *Weger* 3727 (K). Serelal distr.: Wonderkop, XII. 1931, *Goossens* 849 (K, N); Doonkop, XII. 1931, *Goossens* 888 (K, N, W); Ferrara, XII. 1931, *Goossens* 958 (K, N, W). Bethlehem distr.: Bethlehem II. 1919, *Potts* 4119 (K, N); do., X. 1901, *Richardson* s.r. (B, P, V, W). Heilbron distr.: Heilbron, I. 1931, *Goossens* 418 (N) et 547 (N). Kroonstad distr.: Kroonstad, *Pont* 4 (N) et 99 (GU) et 100 (Z). Hoopstad distr.: Near Hoopstad, *Grindon* s.n. (K, N). Near the Vaalrivier: *Burke* 165 (BM, K, N, S).

TRANSVAAL PROVINCE.

Potchefstroom distr.: Klerksdorp, I. 1910, *Weeber* H. 5648 (N). Vereeniging distr.: Vereeniging, II. 1917, *Burt Davy* 17163 (B, N); do., III. 1917, *Burt Davy* 17496 (K, W); do., XII. 1914, *Burt Davy* 15091 (BH); do., IV. 1936, *Story* 57 (N). Heidelberg distr.: Henley-on-Klip, II. 1922, *Stent* H. 21585 (N) et IV. 1925, *Stent* H. 21788 (N); Uitgevalen, XII. 1909, *Burt Davy* 9161 (N). Wakkerstroom distr.: Amersfoort, III. 1917, *Burt Davy* 17363 (K). Volksrust, V. 1920, *Mogg* 7526 (N). Ermelo distr.: Nooitgedacht, I. 1917, *Henrici* 1524 (N, W). Johannesburg distr.: Johannesburg, II. 1925, *Moss* 16255 (W, WR); do., III. 1927, *Moss* 16964 (K); do., II. 1928, *Blenkiron* 765 (K) et 1084 (K); Witpoortje, I. 1898, *Conrath* 879 (V, Z). Pretoria distr.: Pretoria, II. 1929, *Mogg* 16143 (N); do., III. 1905, *Burt Davy* 4514 (N); do., *Nelson* 5 (K); Saltpan, II. 1929, *Leemann* TM. 27302 (T); Hamanskraal, I. 1894, *Schlechter* 4197 (A, B, BM, G, K, V, W); Between Elandsrivier and Klippan, *Rehmann* 5124 (B, BM, K, Z). Waterberg distr.: Makapanspoort, I. 1894, *Schlechter* 4324 (A, B, BM, G, K, T, V); Potgietersrust, *Nelson* 55 (K); Pietersburg distr.: Sand Rivier, II. 1895, *Schlechter* 6908 (B, BM, G, K, V, Z).

TYPE SPECIMEN.

Burke 165 is deposited in The Herbarium, Royal Botanic Gardens, Kew.

COMMON NAMES.

Besemgras. Koperdraadgras. Steekgras. Teesuikergras.

ECONOMIC NOTES.

Opinion differs as to the value of this species. It is said in one case that cattle relish this species, whereas in other cases it is said to be particularly unpalatable even in the young condition. It is supposed to be one of the least palatable grasses in the mountain area. The fruits penetrate the skins of animals and so are injurious to stock.

REMARKS.

Careful examination of the type (Kew) and isotypes (British Museum, South Afr. Museum) has shown that the lemmas of many spikelets are more or less articulated. This articulation may at times be rudimentary or even absent in many spikelets, but its position and nature is similar to that typical of the well-defined § *Arthratherum*. The degree of development of the articulation in any particular specimen appears to be more or less correlated with the age of that specimen. The presence of a distinctly bifid callus and the very unequal glumes are furthermore important characters in support of my view that *A. Burkei* Stapf has been placed incorrectly by earlier authors in the § *Chaetaria*. The species must moreover be removed from that section to find its natural position in § *Arthratherum*. Because of its close affinity to *A. diffusa* Trin. I have placed it as a variety under that species.

Theron in Fedde, Rep. 14. 7 (1936) places *A. Burkei* in the same category as *A. Marlothii* Hack. and *A. Dregeana* (Nees) Trin. et Rupr. The two last-named species are typical representatives of the § *Stipagrostis*, and members belonging to this section form a morphologically well-defined group. In my opinion it is taxonomically impossible to class together a typical representative of the § *Arthratherum* with members of the § *Stipagrostis*. For this reason I am unable to accept Theron's suggested classification. It may however be possible to subdivide the existing organographic sections more satisfactorily on basis of a combined consideration of the organographic and anatomical characters. Such an investigation (to which cytological investigation could be coupled) would certainly yield interesting results. This work however lies wholly beyond the scope of the present paper.

58b. *A. diffusa* Trin. var. **Pseudo-Hystrix** (Trin. et Rupr.) Henrard Crit. Rev. 3. 471 (1928); Henrard Monogr. 1. 97 (1929).

A. diffusa Trin. var. *brevestipitata* (Trin. et Rupr.) Henrard Crit. Rev. 3. 665 (1928); Henrard Monogr. 1. 97 (1929). *A. pseudohystrix* (Trin. et Rupr.) Steud. Syn. Pl. Glum. 1. 142 (1854). *A. vestita* Thunb. sec. Steud. Syn. Pl. Glum. 1. 142 (1854) pro parte, non Thunb. *A. vestita* Thunb. var. *brevestipitata* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. 3. 747 (1852). *A. vestita* Thunb. var. *Pseudo-Hystrix* Trin. et Rupr. Spec. Gram. Stip. 158 (1842); Walp. Ann. Bot. 3. 747 (1852); Dur. et Schinz, Consp. 5. 810 (1894).

The facies of this variety closely resembles that of the species but differs from it by the very short column of the awns. The length of the column is somewhat variable, it may be almost completely absent or reach a length of up to 4 mm. This variation at first led the author of this paper to place one and the same gathering viz. Zeyher 447 under both the vars. *brevestipitata* and *pseudohystrix*. Ecklon and Zeyher s.n. from Uitenhage at one time shared the same lot. Study of more comprehensive material however has shown that the forms of *A. diffusa* having short columns (up to 4 mm.) should all be placed under the var. *Pseudo-Hystrix*.

CAPE PROVINCE.

Cape distr. : Little Lion's Head, III. 1936, Adamson 808 (U). Tulbagh distr. : Winterhoek, Zeyher NH. 8685 (N). Riversdale distr. : Near Riversdale, XI. 1892, Schlechter 1764 (BH, G). Laingsburg distr. : Whitehill, VIII. 1923, Compton 2881 (BH). Uitenhage distr. : On fields near Zwartkopsrivier, Zeyher 447 (A, BH, K, N, O, Z); do., Zeyher 849 (B); between Koega and Sundays Rivers, Ecklon et Zeyher (A, BH, N); Redhouse,

X. 1908, *Paterson* 263 (A, BH); Zwartkopsrivier, *Drège* (LG); Olifantshoek along Bushman River, *Drège* (B). Port Elizabeth distr.: Port Elizabeth, *E.S.C.A. Herb.* 121 (K). Murraysburg distr.: Murraysburg, III. 1879, *Tyson* 1697 (D). Somerset East distr.: Between Little and Great Fish Rivers, *Drège* (LG).

WITHOUT PRECISE LOCALITY.

Rohlmeyer s.n. (B); *Verreaux* s.n. (G); *Roivin* s.n. (K); *Zeyher* s.n. (LG).

TYPE SPECIMEN.

The specimen on which Trinius et Ruprecht based their description is deposited in the Trinius Herbarium, Leningrad. It bears no data as to collector or precise locality but "Ar. vestita var. A. Pseudohystrix Cap. b. sp. 1837".

59. *A. mollissima* *Pilger* in *Engl. Bot. Jahrb.* **40**. 80 (1908); *Schultze*, *Namaland et Kalahari* 581 (1907) nomen tantum; *Henrard Crit. Rev.* **2**. 354 (1927); *Henrard Monogr.* **1**. 99 cum ic. tab. 30 (1929).

A. elymoides *Mez* in *Fedde, Rep.* **17**. 148 (1921); *Henrard Crit. Rev.* **1**. 166 (1926).

A densely caespitose erect fairly robust *perennial*, including the culms up to 80 cm. high. Culms strictly erect, many-noded, simple, or more rarely scantily branched from the upper nodes; nodes glabrous; internodes exserted, up to 20 cm. long, densely woolly or lanate-tomentose, more or less terete, greenish. *Leaf sheaths* pallid; the lower lax and slipping off the culms, striate, almost glabrous or fairly densely woolly tomentose; the upper sheaths glabrous, striate, smooth, terete and tight; *ligule* a short hairy rim, auricles with a flake of wool or merely ciliate; collar glabrous or minutely pubescent; *blades* linear (the lower) to filiform (the upper), up to 30 cm. long and 3 mm. wide, but usually much shorter, and narrower, involute, erect or somewhat spreading, acute, lower surface glabrous, smooth and striate, the upper surface scaberrulous, tip acute but not pungent. *Panicle* usually sheathed by the uppermost leaf or shortly exserted, narrow, very dense and spike-like, up to 20 cm. long; axis densely lanate; branches numerous and very short, adpressed, somewhat lanate. *Spikelets* almost sessile, narrow, glabrous, pallid, erect. *Glumes* very unequal, shortly awned narrowly-lanceolate, 1-nerved, scabrous on the keel, and minutely scaberrulous upwards; the lower from 10–14 mm. long; the upper from 17.5–24 mm. long. *Lemma* including the callus and up to the articulation 8.5–10 mm. long, tubercles, smooth and very minutely granular; *callus* 2–2.5 mm. long, acute, densely but shortly hairy; column of the awns 17–26 mm. long, strongly twisted, scabrous; awns more or less equal, scabrous, spreading, 2.8–5.5 cm. long.

SOUTH WEST AFRICA.

Okavango area, Runtu, V. 1939, *Volk* 1741 (D).

BECHUANALAND PROTECTORATE.

Between Senuma (Sekoma?) and Kooa (Kooi?), I. 1905, *Schultze* 342 i (B, N); Sevrelela (Sevrelela?), X. 1904, *Schultze* 241 a (B).

CAPE PROVINCE.

Mafeking distr.: Mafeking, IV. 1929, *Pole Evans* 2435 (K, N). Kimberley distr.: Picardi, III. 1936, *Wilman* 4089 (B, K, L, Mc, N, V, Z).

ORANGE FREE STATE.

Kroonstad distr.: Bothaville, VI. 1931, *Boshoff* 8 pro parte (N); do., I. 1933, *Goossens* 1175 (B, N).

TYPE SPECIMEN.

Schultze 342 i is deposited in the Botanisches Museum, Berlin-Dahlem. The specimen is overmature and thus poor.

60. **A. stipitata** Hack. ap. Schinz in Verh. Bot. Ver. Prov. Brandenb. **30**. 143 (1888); Dur. et Schinz, Consp. **5**. 809 (1894); Hack. in Bull. Herb. Boiss. **4**. Append. III. 19 (1896); Stapf in Dyer, Fl. Cap. **7**. 560 (1899) sub. *A. sieberiana* Trin. var.; Dinter in Fedde, Rep. **15**. 342 (1918); Garabedian in Ann. S. Afr. Mus. **16**. II. 405 (1925); Henrard Crit. Rev. **3**. 590 (1928); Henrard Monogr. **1**. 106 cum ic. tab. 35 (1929); Range in Fedde, Rep. **33**. 9 (1933); Theron in Fedde, Rep. **40**. 28 (1936) [*sphalm. stipitata*].

Densely caespitose erect *perennial*. Culms up to 100 cm. high, robust, glaucous, simple below, usually branched from the upper nodes; internodes compressed (?), glabrous; nodes exserted, glabrous. *Leaf-sheaths*, broad, slipping from the culms, glabrous; *ligule* a ciliate rim; *blades* flat or at length involute, up to 20 cm. long and 2-3 mm. wide, glabrous on the lower surface, scaberulous on the upper surface, glaucous. *Panicle* almost spicate, narrow, dense, contracted, up to 25 cm. long; branches binate, branched from near the base; branchlets and pedicels short. *Glumes* unequal, glabrous; the lower about 10-13 mm. long, scabrous on the keel, acuminate, shortly awned; the upper 20-22 mm. long. *Lemna* 9-10 mm. long including the callus, tubulous, finely punctulate; *callus* \pm 3 mm. long, very acute, densely hairy; column of awns up to 40 mm. long, strongly twisted; awns subequal, capillary, up to 60 mm. long.

SOUTH WEST AFRICA.

Omatope, II. 1886, Schinz 658 (K, N, V, Z); Onumakunde, *Rautanen* 8 (P); Okahandja, II. 1928, Bradfield 278 (T); Gobabis, XII. 1921, Wilman s.n. (BH, S).

TYPE SPECIMEN.

Schinz 658 in the Botanisches Museum, Zürich and the Naturhistorisches Museum, Wien are to be regarded as the type.

61. **A. graciliflora** Pilger in Engl. Bot. Jahrb. **33**. 599 (1907); Henrard Crit. Rev. **1**. 211 (1926); Henrard Monogr. **1**. 112 cum ic. tab. 40 (1929).

A. ramifera Pilger in Engl. Bot. Jahrb. **33**. 59 (1907); Henrard Crit. Rev. **3**. 492 (1928); Henrard Monogr. **1**. 114 cum ic. tab. 40 (1929). *A. Sieberiana* Trin. sec. Stapf in Dyer, Fl. Cap. **7**. 560 (1899); Stent in Bothalia **1**. IV. 278 (1924); Garabedian in Ann. S. Afr. Mus. **16**. II. 404 (1925), omnes non Trin. *A. stipitata* Hack. sec. Eyles in Trans. Roy. Soc. S. Afr. **5**. IV. 304 (1916) excl. syn., non Hack.

Robust erect caespitose *perennial*. Culms simple below but usually branched from the upper nodes, up to 120 cm. high, about 5-noded; internodes more or less equal, terete, obscurely striate, glabrous, somewhat glaucous; nodes glabrous, exserted. *Leaf-sheaths* glabrous, striate; the lower more or less rigid, lax, the upper fairly lax, glaucous and at length slipping from the culms; *ligule* a ciliate rim; auricles densely long-bearded or only pubescent; collar pubescent or glabrous; *blades* variable in length, up to 30 cm. long, linear, usually convolute, erect or spreading, glabrous and striate on the lower surface, scaberulous on the upper surface. *Panicles* erect, sub-spicate to fairly lax and interrupted, about 20 cm. long, branches adpressed to the rachis or eventually spreading on maturity, solitary to 3-nate, angular, scaberulous on the angles; pedicels slightly scaberulous, usually shorter than the glumes. *Glumes* unequal, acute, awned; the lower about 10 mm. long, scaberulous on the keel; the upper up to 20 mm. long, minutely scaberulous upwards. *Lemna* tubular, somewhat mottled with purple, glabrous, finely punctulate, including the callus up to 11 mm. long; *callus* very acute, densely hairy, 2 mm. long; column of awns very variable in length, up to 25 mm. long, strongly twisted; awns subequal, capillary, spreading, up to 60 cm. long.

SOUTH WEST AFRICA.

Onumakunde, III. 1905, *Rautanen* 8 (Z); Waterberg, V. 1928, Bradfield 388 (K, N); do., I. 1939, Volk 1002 (D); Neidsas, IV. 1939, Volk A. 155 (D); Olamakaris ?, II. 1939, Volk 1191 (D).

CAPE PROVINCE.

Hay distr. : Near Postmasburg, VI. 1929, *Uys* G. 17 (N). Kimberley distr. : Kimberley, I. 1937, *Acoc* 1626 (K, Mc); Carter's Ridge, I. 1937, *Acoc* 1605 (K, Mc); Riverton, III. 1918, *Wilman* 2522 (BH, Mc). Barkly West distr. : Droogveld, II. 1934, *Cooke* 3235 (K); Waldeck's Plant, V. 1936, *Cooke* s.n. (K) et XII. 1936, *Acoc* 1432 (Mc). Kuruman distr. : Cowley, VI. 1936, *Acoc* 458 (Mc). Vryburg distr. : Armoedsvlakte, III. 1921, *Mogg* in Herb. Stell. 12610 (St).

ORANGE FREE STATE.

Boshof distr. : Smitskraal, VI. 1911, *Burt* *Davy* 10319 (N) et 10366 (N). Hoopstad distr. : Wesselsbron, I. 1933, *Goossens* 1250 (N); De Rots, II. 1933, *Goossens* 1283 (N). Kroonstad distr. : Bothaville, I. 1933, *Goossens* 1152 (B, N) et 1176 (B, N); do., IV. 1931, *Boshoff* 8 (N). Heilbron distr. : Maccauvlei, II. 1926, *Brandmuller* 118 (N).

TRANSVAAL PROVINCE.

Bloemhof distr. : Christiana, III. 1912, *Burt* *Davy* 13030 a (N) et 13113 (N); Cawood's Hope, III. 1912, *Burt* *Davy* 12984 (N); Kameelpan, I. 1934, *Theron* 527 (N). Wolmaransstad distr. : Boskuil, V. 1929, *Sutton* 112 (N); Vaalbank, IV. 1931, *Liebenberg* 2355 (N, W). Potchefstroom distr. : Ventersdorp, III. 1931, *Pole Evans* 3144 (B, N) et without locality *Theron* 4 (N). Rustenburg distr. : De Put, II. 1933, *Van Nouhuys* 22 (T). Pretoria distr. : Pretoria, XII. 1929, *Liebenberg* 8330 (B, K, N, W); do., IV. 1933, *Smith* 6567 (N); De Wildt, II. 1933, *Irvine* s.n. (N); Klipfontein, VIII. 1880, *Nelson* 103 (K); between Klippan and Elandsrivier, *Rehmann* 5111 (BM, K, V, Z). Waterberg distr. : Twenty-four Rivers, XII. 1919, *Burt* *Davy* 18259 (K) et 18260 (K); Naboomspruit, I. 1919, *Galpin* M. 425 (N, W); Potgietersrust, I. 1909, *Leendertz* 1983 (T). Zoutpansberg distr. : Messina, II. 1919, *Rogers* 22576 (T). Barberton distr. : Komatipoort, XII. 1897, *Schlechter* 11744 (A, BH, N).

BECHUANALAND PROTECTORATE.

Mahalapye, IV. 1931, *Pole Evans* 3204 (K, N) et 3207 (N).

PORTUGUESE EAST AFRICA.

Ressano Garcia, XII. 1897, *Schlechter* 11934 (A, B, BH, BM, G, K, P, V, Z); Lourenco Marques, XII. 1897, *Schlechter* 11966 (BH, BM, G, K, N, P, Z); do., I. 1898, *Schlechter* 11984 (A, B, BH, BM, G, K, N, P, Z); do., *Monteiro* s.n. (K); do., *Junod* 23 (T); do., X. 1919, *Shantz* 337 (K, W); do., VII. 1922, *Moss* 6907 (WR). Chibuto, X. 1935, *Lea* 135 (N); *Maputaland Expedition*, VI. 1914, T.M. 14338 (BH, T).

TYPE SPECIMEN.

Schlechter 11984 is deposited in the Botanisches Museum, Berlin-Dahlem.

Common NAME.

Steekgras.

ECONOMIC NOTES.

Opinion differs as to the value of this species as a fodder for stock. It is stated to be eaten in South West Africa whereas in the Western Transvaal and the Orange Free State it is reported to be very coarse and thus unpalatable.

62. **A. hordeacea** Kunth Rev. Gram. 2. tab. 173 (1830); Kunth, Enum. 1. 196 (1833); Walp. Ann. Bot. 3. 746 (1852); Steud. Syn. Pl. Glum. 1. 142 (1854); Dinter in Fedde, Rep. 15. 342 (1918) [spalm. *hordacea*]; Garabedian in Ann. S. Afr. Mus. 16. II. 402 (1925); Henrard Crit. Rev. 2. 241 (1927); Henrard Monogr. 1. 140 cum ic. tab. 54 (1929); Range in Fedde, Rep. 33. 9 (1933).

A. hordeacea Kunth var. *longiaristata* Henrard Crit. Rev. 2. 244 (1927); Henrard Monogr. 1. 140 (1929). *A. Steudeliana* Trin. et Rupr. Spec. Gram. Stip. 155 (1842); Henrard Crit. Rev. 3. 588 (1928).

Annual, usually fairly robust and much-branched from the base and lower nodes. *Culms* up to 85 cm. high including the inflorescence, or in weak specimens 20-30 cms. high, erect or somewhat geniculately ascending, several-noded; internodes fairly rigid, compressed, striate, densely pubescent with spreading or reflexed short hairs, sometimes becoming almost glabrous, usually exserted; nodes constricted, more or less densely pubescent. *Leaf-sheaths* striate, compressed, keeled, pubescent, with narrow hyaline margins, usually shorter than the internodes; *ligule* shortly ciliate; auricles shortly bearded; collar smooth; *blades* linear-lanceolate, more or less glaucous, flat or folded lengthwise, keeled, acute, scabrous on both surfaces or hirtellous above, many-nerved, up to 30 cm. long and 0.9 cm. wide. *Panicle* linear-oblong or subovate, exserted, in robust plants up to 24 cm. long, but usually much shorter, densely contracted, compact and spike-like, usually only somewhat interrupted at the base; peduncle and axis densely pubescent; branches solitary much-divided from the base; branchlets and spikelets fascicled; pedicels short and pubescent. *Spikelets* congested, linear-lanceolate, greenish or pallid in colour. *Glumes* lanceolate, manifestly awned, 1-nerved, keeled, bifid near the apex, scaberulous dorsally; the lower scabrous on the keel, from 6-11 mm. long excluding the 2.5-5 mm. long awn; the upper smooth on the keel, 7-12 mm. long excluding the 1-4 mm. long awn. *Lemmas* narrowly linear, fusiform, with many longitudinal lines of characteristic spiny hairs from the base to the summit, ventrally somewhat furrowed, narrowed towards the apex, up to 7.5 mm. long including the callus, articulation evident; *callus* rounded, short, densely bearded, about 0.5 mm. long; awns subequal, scabrous, erect or somewhat spreading, from 35-50 mm. long.

ANGOLA.

Between Gambos and Cabama, V. 1909, *Pearson* 2481 (V) et 2482 (V); without precise locality, VI. 1936, *Martins* 33 (N).

SOUTH WEST AFRICA.

Andoni, *Barnard* 813 (K, N, S); Ossa, III. 1939, *Volk* 1564 (D); Fockshof, IV. 1939 *Volk* A. 156 (D). Tsumeb, III. 1934, *Dinter* 7444 (B, N); do., IV. 1913, *Engler* 6105 (B, K, N); Otavi, III. 1925, *Dinter* 5751 (BH, G, GU, N, S, Z); Okatjongeama, *Dinter* 1587 (B); do., *Seiner* 527 (B); Duwib, *Boss* TM. 36022 et 36166 (T); between Okahandja and Waterberg, *Kolon. Wüstenhausen* s.n. (B); Hoachanas, III. 1911, *Dinter* 1933 (B).

WITHOUT PRECISE LOCALITY.

Lüderitz 41 (B, Z) et 65 (B, Z); Bumbo, IV. 1903, *Fritzsche* 17 (B).

BECHUANALAND PROTECTORATE.

Francistown, IV. 1929, *Gordon* 49 (N).

TYPE SPECIMEN.

The type is deposited in the Botanisches Museum, Berlin-Dahlem.

COMMON NAMES.

Sauergras. Wilde Gerste.

ECONOMIC NOTES.

This species is not readily eaten by stock. In the young condition however it is eaten to some extent, whereas in the mature condition it is injurious on account of the awns which penetrate the palates of stock.

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THE GENUS *PLINTHUS*.

By I. C. Verdoorn.

The genus *Plinthus* was described by Fenzl. in "Nov. Stirp. Mus. Vindob. Dec. VII n 60 in 1839 with the single species *P. cryptocarpus*. It was founded on a plant collected by Drège near Rietpoort Nieuweveld. In 1913 (Engl. Bot. Jahrb. vol. 48, p. 499) two further species were described, *P. sericeus* Pax and *P. Rehmannii* Schellenb. They differed from the type species in vegetative characters, the leaves all being alternate and not closely imbricate.

One of the species described for the first time in this paper, *Plinthus karooicus*, differs from all the described species in the number of the ovary chambers, styles and perianth lobes. While these differences might be considered sufficient to justify the species being placed in a distinct genus, a study of all the available herbarium material shows many characters in common which bind them together into a natural group. It has therefore been decided to amplify the description of the genus *Plinthus* Fenzl. to include this species.

The second species described here agrees with the original generic description as far as the gynoecium is concerned but differs in the leaves being alternate and loosely arranged, that is each leaf usually shorter than the internode.

Plinthus Fenzl. descr. ampl.

Suffrutex humifusus pilis diaphanis biacuminatis adpressis sericeus. *Folia minima* opposita vel alterna, imbricata, pilis biacuminatis sericea. *Flores* 1-3, axillares, sessiles vel sub-sessiles. *Calyx* 4-5-lobatus, extus pilis biacuminatis sericeus. *Corolla* nulla. *Stamina* 4-5, tubo inserta, cum sepalis alternantia. *Ovarium* 2-3-(rarius 4-) locale, papillosum vel pubescente, loculis monospermis. *Stylus* 2-3-(rarius 4-) partitus.

KEY TO SPECIES.

Ultimate shoots and most of the leaves opposite; the opposite leaves joined by a ridge giving the twigs a jointed appearance; leaves on terminal shoots imbricate:

- | | |
|--|--------------------------|
| Perianth 5-lobed; ovary 3 (rarely 4)-chambered; styles 3 (4)-partite; leaves 4-6 mm. long..... | <i>P. cryptocarpus</i> . |
| Perianth 4-lobed; ovary 2-chambered; styles 2-partite; leaves 2-4 mm. long..... | <i>P. karooicus</i> . |

Ultimate shoots and all leaves alternate; leaves not imbricate:

- | | |
|---|------------------------|
| Leaves when fully developed ovate-elliptic, petioled..... | <i>P. Rehmannii</i> . |
| Leaves linear to narrowly lanceolate, subsessile, usually longer than the internodes..... | <i>P. sericeus</i> . |
| Leaves triquetrous, sessile, usually shorter than the internodes..... | <i>P. laxifolius</i> . |

***Plinthus karooicus* Verdoorn sp. nov.; *P. cryptocarpus* Fenzl. affinis sed perianthio 4-lobato ovario 2- locale, stylo 2- partito differt.**

Suffrutex humifusus, ramosus, basi valde lignosus, ramulis tenuibus ultimis oppositis pilis biacuminatis pubescentibus appresse. *Folia* sessilia, opposita alterna-que (opposita base transverse connata), imbricata, sub-carnosa, 2-4 mm. longa 0.5-1 mm. lata, dorso convexa, ventro concava, obtuse acuminata, pilis adpressis retrorsis bi-acuminatis diaphanis

strigosa. *Flores* axillares, 2-3-nati, 2-3-bracteolati. *Perianthium* 4-lobatum ± 1.75 mm. longum; *tubus* 0.75 mm. longus; *lobi* 1 mm. longi, 0.75 mm. lati. *Stamina* 4; *filamenta* perianthio longiora. *Ovarium* 2-loculare, 0.75 mm. longum, apice pilis erectis, diaphanis pilosum. *Stylus* 2-partitus, ramis \pm divaricatis, 1 mm. longis.

A low growing much branched shrublet with a thick woody base and comparatively slender branchlets, the ultimate branchlets opposite, appressed pubescent with bi-acuminate transparent hairs. *Leaves* opposite and alternate, the opposite ones connected at the base by a ridge giving the twig a jointed appearance, imbricate on ultimate shoots, somewhat fleshy, rounded dorsally and concave on the face, bluntly pointed, about 2-4 mm. long, 0.5-1 mm. wide, pubescent with appressed bi-acuminate transparent hairs. *Flowers* axillary, 2-3-nate, 2-3-bracteolate; *perianth* ± 1.75 mm. long, 4-lobed; *tube* 0.75 mm. long; *lobes* 1 mm. long, 0.75 mm. broad, ovate. *Stamens* 4, inserted near the base of the tube and alternating with the lobes; *filaments* as long as or longer than the *perianth*. *Ovary* crowned with erect transparent hairs, 2-chambered, about 0.75 mm. long and 0.75 mm. diameter. *Style* 2-partite to the base, the branches diverging, about 1 mm. long.

ORANGE FREE STATE.

Fauresmith Dist., Heenenweerskop, *Smith* 5286 (Type) Cult. in Plots Fauresmith Veld Reserve, *Verdoorn* 1106, 2287.

CAPE PROVINCE.

Middelburg Dist., open veld College of Agriculture, Grootfontein, *Verdoorn* 1527, *du Toit* 29. Kimberley near Schmidts Drift Road. *Acocks in Herb. Hafstrom* H 1248; along Boshof Road, *Esterhuysen* 818. Prieska Dist. *Bryant* 343; Brakbosch, between Prieska and Kenhardt *Pole Evans* 2246 and 2247.

SOUTH WEST AFRICA.

Aus. *Dinter* 4131.

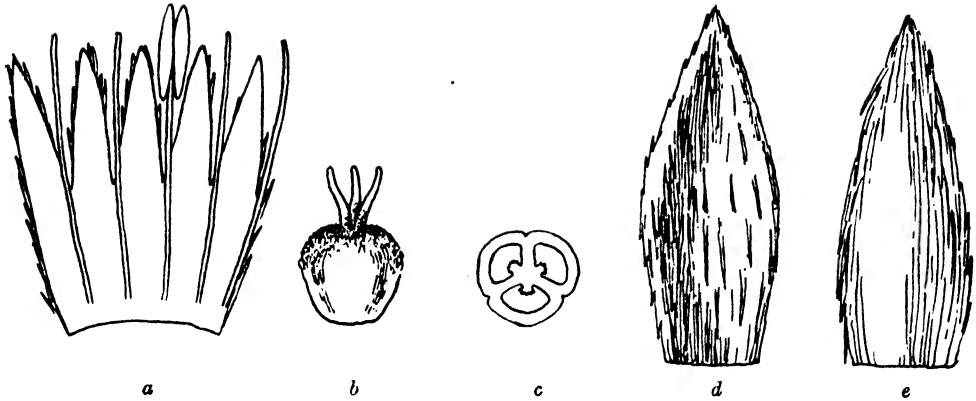
Note.—This plant is browsed by sheep in the Karroo and is considered to be a good fodder plant. It is known in the Fauresmith District as "Karoo Ganna".

Plinthus laxifolius *Verdoorn* sp. nov; *P. sericeo* Pax affinis sed foliis laxis internodiis brevioribus differt.

Suffrutex (caulem non vidi) diffusus, ramosus, ramulis tenuibus alternis. *Folia* sessila, alterna, sub-carnosa, 3-7 mm. longa, 1 mm. lata, dorso convexa, ventro leviter canaliculata, obtuse acuminata, pilis appressis bi-acuminatis diaphanis pubescentia. *Flores* 2-3-bracteolati, axillares, 1-3-nati, in ramulis ultimis brevissimis pseudo glomerati. *Perianthium* 5-lobatum ± 1.75 mm. longum; *tubus* 0.75 mm. longus; *lobi* 1 mm. longi, 0.5 mm. lati, dorse pilis biacuminatis diaphanis sericei. *Stamina* 5; *filamenta* perianthio breviora, 0.75 mm. longa. *Ovarium* 3-loculare, papillosum, 0.5 mm. longum. *Stylus* 3-partitus, ramis \pm divaricatis, 0.5 mm. longis.

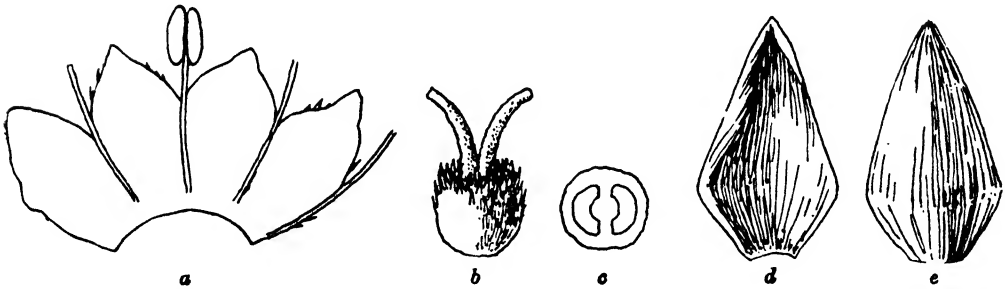
A much branched shrublet with slender branches, but basal part not seen; the younger oppressed pubescent with bi-acuminate, transparent hairs. *Leaves* all alternate, rather lax, mostly shorter than the internodes, somewhat fleshy, 3-7 mm. long, 1 mm. wide, rounded on the back and slightly canaliculate on the face, bluntly pointed, oppressed pubescent with bi-acuminate transparent hairs. *Flowers* 2-3-bracteolate in the axils of the leaves 1-3-nate, appearing glomerate in the upper leaves where they are clustered on very much abbreviated axillary shoots, not longer than the subtending leaf. *Calyx* 5-lobed; *tube* 0.75 mm. long; *lobes* 1 mm. long, 0.5 mm. wide, dorsally oppressed pubescent with bi-acuminate transparent hairs which project above the apex of the lobe. *Stamens* 5; *filaments* shorter than the *calyx*, 0.75 mm. long. *Ovary* 3-chambered, papillose, 0.5 mm. long; *style* 3-partite, branches diverging, 0.5 mm. long.

"Kalahari Sand Dunes", exact locality unknown, probably Kenhardt district, *Kotze* 824.



I.—*Plinthus cryptocarpus* Fenzl. Flower from Drege specimen ex Stockholm.

- (a) Perianth slit one side, shewing attachment of stamens.
- (b) Ovary and styles.
- (c) Transverse section of ovary.
- (d) Bract, dorsal view.
- (e) Bract, shewing inner surface.



II.—*Plinthus karooicus* Verdoorn. Flower from I. C. Verdoorn 1106.

- (a) Perianth slit one side, showing attachment of stamens.
- (b) Ovary and styles.
- (c) Transverse section of ovary.
- (d) Bract, showing inner surface.
- (e) Bract, dorsal view.

OTTO KUNTZE TYPE SPECIMENS OF SOUTH AFRICAN PLANTS.

By R. A. Dyer.

In 1898 Otto Kuntze published his "*Revisio Generum Plantarum* vol. 3 pt. 2". In this he included an enumeration of specimens collected during his travels in South America (1891-2) and in South Africa (1894). An examination by American botanists of Otto Kuntze's type specimens of South American plants housed in the Herbarium of the New York Botanical Garden, revealed a large percentage of errors of identification. The suggestion was then made by the Head Curator of the Herbarium that an examination of the South African types would yield equally interesting results and that the types would be forwarded on loan to the National Herbarium, Pretoria, if it was desired to undertake the work. The offer was gratefully accepted and the present paper is the outcome.

As a general rule the types were found to be in a poor state of preservation due mainly to faulty preparation in the first place. Many of the specimens show marked evidence of mould. Not all the types cited by Kuntze were located in the New York Herbarium and it was suggested that some of those outstanding might have been misfiled. The following types were not seen by me, the page numbers being those of Kuntze's work cited above:—

Nasturtium riparium, p. 6.
Geranium robustum, p. 32.
Acacia latibracteata, p. 48.
Alepida aquatica, p. 110.
Anisothrix Kuntzei, p. 129.

Crocodilodes (Berkheya) amplexicaule, p. 143.
Euphorbia laxiflora, p. 286.
Sapium Simii, p. 293.
Tragia Bolusii, p. 293.

Some of these have been cited by later workers and in such cases their identifications are given with the reference to the respective publications. *Indigofera Kuntzei* (*Anila Kuntzei*) from Mosambique and *Limeum glaberrimum* from Delagoa Bay have been omitted. In most other cases the types have been matched with specimens in the National Herbarium, Pretoria. The examination of types of new varieties was not undertaken. It has been found necessary to establish the following new names and new combinations:—

Berkheya microcephala comb. nov. (*Stobaea microcephala* DC.) in a note under *Berkheya Kuntzei*.

Senecio Verdoorniae nom. nov. (*Hertia Kuntzei*).

Senecio paucicephalus nom. nov. (*Hertia natalensis*).

Gnidia gymnostachya (C. A. Mey.) Gilg. var. *phaeotricha* M. Moss comb. nov. (*Gnidia phaeotricha*).

Gnidia sericocephala (Meisn.) M. Moss comb. nov. (*Gnidia pretoriae*).

The identifications of the types are given in the order in which the descriptions appear in Kuntze's *Revision*. Where necessary the revised name follows that of Kuntze and the present accepted name is given in heavy type. I wish to express my appreciation of assistance with some of the identifications by specialists in certain groups. The names of such workers appear under the respective species or family.

TILIACEAE.

Grewia Krebsiana O. Kuntze, p. 26.—Cape Province ; Beaufort West.

G. robusta Burch. Trav. 2, 133 (1824) ; Burret in Engl. Bot. Jahrb. 45, 195 (1911).

G. flava Harv. in Fl. Cap. I, 225 (1859–1860) not of DC.

MALPIGIACEAE.

Triaspis transvalica O. Kuntze, p. 29.—Transvaal ; Pretoria.

Sphedamnocarpus transvaalicus (O. Kuntze) Burt Davy Fl. Transvaal I, 284 (1932) : (*S. transvaalica* in error).

As in several other instances Kuntze omits one *a* from *vaal* in forming the specific epithet from Transvaal.

GERANIACEAE.

Geranium robustum O. Kuntze, p. 32 ; R. Knuth in Das Pflanzenr. 4, 129. 166 (1912)—Natal ; Charlestown.

RHAMNACEAE.

Phyllica glabriflora O. Kuntze, p. 39.—Cape Province ; Caledon.

P. brevifolia E. & Z. Enum. 133 (1834).

Identification by N. S. Pillans.

(Ampelidaceae) VITACEAE.

Vitis (*Cissus*) *cradockensis* O. Kuntze, p. 40.—Cape Province ; Cradock.

Cissus quinata Ait. Hort. Kew. ed. 2, I. 260 (1810) ; Gilg & Brandt in Engl. Bot. Jahrb. 46, 521 (1912).

Vitis (*Cissus*) *repandospinulosa* O. Kuntze, p. 41.—Natal ; Ladysmith.

Cissus humilis (N.E.Br.) Planch. in DC. Mon. Phan. 5, 2, 463 (1887) ; Gilg & Brandt l. c. 488.

The Kuntze type is very mouldy and under this unnatural covering can be seen scattered hairs on the stem and inflorescence. The term *glaberrima* used by Kuntze in the description is therefore inaccurate.

Authenticated material of *Cissus dolichopus* C.A.Sm. in the Nat. Herb. Pretoria, exhibits a variable pubescence and it is considered that this name should also be referred to the synonymy of *C. humilis* (N.E.Br.) Planch.

MELIANTHACEAE.

Melanthus insignis O. Kuntze, p. 43.—Natal ; Charlestown.

M. Dregeana var. *insignis* Phill. & Hofmeyr in Bothalia 2, Ib. 352 (1927).

M. comosus Burt Davy in Fl. Transvaal I, 490 (1932), not of Vahl.

The type consists of two sheets, one each of flowers and fruits. Although closely allied to *M. Dregeana* the Kuntze species is sufficiently distinct to justify specific separation. In addition to its more robust habit, larger flowers and more densely pilose appearance, the fruits are considerably larger (1.5 cm. long) sub-oblong, with the valves strongly inflexed at the apex forming a depression, and not developed into a strong point as done by the inflexed valves of *M. Dregeana* Sond.

LEGUMINOSAE.

Anila pretoriana O. Kuntze, p. 52.—Transvaal; Pretoria.

Indigofera pretoriana Harms ex O. Kuntze l. c.

Calpurnia mucronulata Harms ex O. Kuntze, p. 54.—Natal; Van Reenen's Pass.

C. intrusa E. Mey. Comm. Pl. 2 (1835).

Cracca triphylla O. Kuntze, p. 57.—Natal; Krantzkloof.

Tephrosia macropoda E. Mey. Comm. Pl. 112 (1835).

T. triphylla Harms ex O. Kuntze l. c.

Identification by H. M. L. Forbes.

ROSACEAE.

Alchemilla Woodii O. Kuntze, p. 75.—Natal; Charlestown.

This species is very closely allied to *A. capensis* Thunbg. and is distinguished from it by the shortly pedicellate flowers somewhat exserted from small leaf-like bracts, and the much shorter outer calyx-lobes.

CRASSULACEAE.

Sedum (Crassula) cogmansense O. Kuntze, p. 83.—Cape Province; Cogmanskloof.

Crassula cogmansensis (O. Kuntze) K. Schum. in Just. Jahresb. 26, I. 347 (1900).

The type has not been matched with any specimen in the Nat. Herb. Pretoria. It belongs to the section *Sphaeritis* Harv. and is evidently closely allied to *C. subaphylla* (E. & Z.) Harv., but differs in the short glabrous, ovate-acute leaves. The plant is apparently somewhat laxly branched. Schonland in Trans. Roy. Soc. S. Afr. 1930 omits mention of *C. cogmansensis*.

Sedum crassiflorum O. Kuntze, p. 84.—Natal; Glencoe.

Crassula vaginata E. & Z. Enum. 298 (1836).

C. crassiflora (O. Kuntze) K. Schum. l. c.

Schonland, l.c. 226, gives the name as "*Cr. crassifolia* O.K.n.sp." possibly taking it incorrectly from a herbarium sheet of the type number. The type sheet has written on it "*Sedum crassiflora*".

Sedum (Crassula) transvalense O. Kuntze, p. 85.—Transvaal; Johannesburg.

Crassula transvaalensis (O. Kuntze) K. Schum., l.c.

Schumann, it will be noted, corrected the spelling of the specific epithet. The label of the type specimen is written up as "*Crassula transvaaliensis* O.K." and Schonland, l.c. 188, has used this form.

(Bruniaceae) VERBENACEAE.

Ptyxostoma quadrifidum O. Kuntze, p. 86. (Bruniaceae); Cape Province; Caledon.

Campylostachys cernua Kunth in Abh. Akad. Berlin 1831, 207 (Verbenaceae).

Kuntze went completely astray in the identification of this plant. Drawings of dissections on the type sheet are inaccurate. The type matches several authentically named specimens of *Campylostachys cernua* in the Nat. Herb. Pretoria, including duplicates of the Burchell and Zeyher gatherings.

LYTHRACEAE.

Nesaea Kuntzei Koehne ex O. Kuntze, p. 97.—Natal; Ladysmith.

The type is not matched in the Nat. Herb. Pretoria.

FICOIDEAE.

(Identifications by Dr. L. Bolus.)

Mesembryanthemum cradockense O. Kuntze, p. 109.—Cape; Cradock.

There are two mounted specimens of this in the New York Herbarium.

Mesembryanthemum pulvinatum O. Kuntze, p. 109—Cape Province; Beaufort West.

Chasmatophyllum musculinum (Haw.) Schw. in Zeitschr. Sukkulantenk. 3, 30 (1927).

There are four sheets of this in the New York Herbarium.

Mesembryanthemum subspinosum O. Kuntze, p. 109.—Cape Province; Cradock.

Drosanthemum obliquum (Willd.) Schw., l.c. 18.

“As far as the material goes the Kuntze type agrees with this species” L. Bolus.

UMBELLIFERAE.

Alepida aquatica O. Kuntze, p. 110.—Cape Province; Toise River Station.

Alepidea amatymbica Ecklon & Zeyher Enum. 1836, 339; Dümmer in Trans. Roy. Soc. S. Afr. 3, 5 (1913).

RUBIACEAE.

Plectronia Chamaedendrum O. Kuntze, p. 122.—Natal.

Pygmaeoathamnus Chamaedendrum (O. Kuntze) Robyns Monog. Vangueriae 1928, 35.

DIPSACEAE.

Cephalaria natalensis O. Kuntze, p. 126.—Natal; Van Reenen's Pass.

Except that it is somewhat more densely pubescent the type is well matched by several specimens in the Nat. Herb. Pretoria.

COMPOSITAE.

Berkheyopsis Kuntzei O. Hoffm. ex O. Kuntze, p. 136.—Cape; Modderriver Station.

B. Echinus (Less.) O. Hoffm. in Engl. Prantl. Natur. Pflanz. Fam. 4, 5. 311 (1894).

Gazania Burchellii DC. Prod. 6, 514 (1837); Harv. in Fl. Cap. 3. 479 (1864–1865) in part.

Harvey, l. c., cites several specimens under *Gazania Burchellii*. Judging by the description of the type and by an examination of a duplicate of Zeyher 976, one of the cited specimens, it appears likely that Harvey included two distinct species under the one name. The specimen of Zeyher 976, in the Nat. Herb. Pretoria, is a small plant agreeing with Harvey's description as far as it goes. Further, it has obtuse lacerate outer pappus scales, and those of the inner row are glabrous, whereas, in the majority of specimens in the Nat. Herb., which agree better with De Candolle's description of *G. Burchellii*, the outer pappus scales are linear-lanceolate, occasionally slightly lacerate in the upper half: the inner row are lanceolate and pubescent. These specimens agree also with the type of *Berkheyopsis Kuntzei*. On the assumption, however, that Harvey was correct in associating *Hirpicium Echinus* Less. (1832) with *Gazania Burchellii* DC. (1837), the Kuntze type of *Berkheyopsis Kuntzei* O. Hoffm. is identified as *B. Echinus* (Less.) O. Hoffm.

Cotula radiata O. Hoffm. ex O. Kuntze, p. 142.—Cape Province ; Toise River Station.

Matricaria nigelliflora DC. Prodr. 6, 50 (1837).

The type specimen of *Cotula radiata* O. Hoffm. was not well prepared and during drying the leaves shrivelled and lost the characteristic glaucous appearance.

Crocodylodes amplexicaule O. Kuntze, p. 143.—Natal ; Krantzklloof.

Berkheya amplexicaulis O. Hoffm. ex O. Kuntze 1.c.

No specimen seen.

Crocodylodes arctiifolium O. Kuntze, p. 143.—Natal ; Van Reenen's Pass.

Berkheya montana Wood & Evans in Journ. Bot. 1897, 351.

B. arctiifolia O. Hoffm. ex O. Kuntze 1.c.

The Kuntze specimen is covered with an unnatural "cobweb" which makes the indumentum appear denser than it is in reality.

Crocodylodes Kuntzei O. Kuntze, p. 143.—Cape ; Modder River Station.

Berkheya Kuntzei O. Hoffm. ex O. Kuntze 1.c.

There are two specimens of this in the New York Herbarium, the type from Modder River Station and the other from Aliwal North. They show a close relationship to *Berkheya microcephala* comb. nov. (*Stobaea microcephala* DC.)

Gnaphalium amplum O. Kuntze, p. 150.—Natal ; Krantzklloof.

Helichrysum platypterum DC. Prodr. 6, 201 (1837).

H. amplum O. Hoffm. ex O. Kuntze 1.c.

Moeser in Bot. Jahrb. 44. 341 (1910) suggests the above identification and this seems justified.

Gnaphalium athrixifolium O. Kuntze, p. 150.—Natal ; Colenso.

Helichrysum athrixifolium O. Hoffm. ex O. Kuntze 1.c.

Moeser 1, c. 221, upholds this species. It is very closely allied to *H. rugulosum*, Less. and *H. polycladum* Klatt, being about intermediate between these in the size of the capitulum: the involucre bracts are light straw coloured as in *H. rosum* Less., another closely allied species.

Gnaphalium Kuntzei O. Kuntze, p. 152.—Natal ; Charlestown.

Helichrysum Kuntzei O. Hoffm. ex O. Kuntze, 1.c.

Moeser, 1.c., 279, upholds this species. It is closely allied to *H. simillimum* DC. and *H. capitellatum* Less.

Gnaphalium mixtum O. Kuntze, p. 152.—Cape Province ; Cathcart.

Helichrysum mixtum O. Hoffm. ex O. Kuntze, 1.c.

Moeser, 1.c., upholds this species but mentions that it is difficult to justify this owing to the close similarity to *H. longifolium* DC. and the apparent polymorphism in species of this group.

Gnaphalium plantaginifolium O. Kuntze, p. 153.—Cape Province ; Cathcart.

Helichrysum coriaceum Sond. in Linnaea 23, 65 (1850) not of Harv. ; Moeser, 1.c. 264.

H. plantaginifolium O. Hoffm. ex Kuntze, 1.c.

Gnaphalium pulviniforme O. Kuntze, p. 153.—Natal ; Van Reenen's Pass.

Helichrysum Sutherlandi Harv. in Fl. Cap. 3, 218 (1864-1865) ; Moeser, 1.c. 306.

H. pulviniforme O. Hoffm. ex O. Kuntze, 1.c.

Gnaphalium Thapsus O. Kuntze, p. 154.—Natal; Highlands Station.

Helichrysum Thapsus O. Hoffm. ex O. Kuntze, l.c.; Moeser, l.c. 263.

Hertia Kuntzei O. Hoffm. ex O. Kuntze, p. 157.—Transvaal; Pretoria.

Senecio Verdoorniae nom. nov.

The Kuntze type is almost identical with *Verdoorn* Nos. 635, 636, 663 and other specimens in the Nat. Herb. Pretoria collected in the Fountains Valley, Pretoria, which is as likely as not where Kuntze collected his type.

S. Verdoorniae is closely allied to *S. albanensis* DC. and one was inclined to regard it as a variety of that species, but *S. albanensis*, already credited with a multitude of forms, and a somewhat unwieldy species in consequence, would have been "stretched" to breaking point to accommodate it. Some of the so called forms of *S. albanensis* may later be segregated as specifically distinct.

The existence of the name *Senecio Kuntzei* necessitates the application of a new name for Kuntze's species, *Hertia Kuntzei*.

Hertia natalensis O. Hoffm. ex O. Kuntze, p. 157.—Natal; Mooi River Station.

Senecio paucicephalus nom. nov.

The Kuntze type is very closely allied to *Senecio albanensis* var. *leiophyllus* Harv. The capitula are solitary on the scapes and a very close match is present in Mogg 7061, which has two capitula on the scape. This was collected in the same area as the type. The base of two capitula on the type are enlarged in a manner suggesting some "fly" infestation which is not an unusual occurrence in the *Compositae*. The author overlooked the abnormality and described the involucre "involucro fructifera basi suberoso-incrassato". Only a single short narrow ray-flower was observed in a capsule on the sheet. Assuming that Kuntze's specimen is specifically distinct from *S. albanensis*, it requires a new name as the specific epithet *natalensis* is already occupied in the genus *Senecio*.

Leontonyx Pumilio O. Hoffm. ex O. Kuntze, p. 162.—Cape Province; Beaufort West.

Helichrysum laneum S. Moore in Journ. Bot. 1918, 6.

The name *Helichrysum pumilum* Hook. f. is applied to a distinct species and to avoid ambiguity the Hoffm. epithet should not be used.

Leontonyx ramosissimus O. Hoffm. ex O. Kuntze, p. 162.—Cape Province; Cradock.

Helichrysum lucilioides, Less. Syn. Comp. 290 (1832).

The type of *Leontonyx ramosissimus* O. Hoffm. shows obvious signs of having been grazed and is consequently unnaturally dwarfed.

Osteospermum glaberrimum O. Hoffm. ex O. Kuntze, p. 165.—Natal; Krantzkloof.

The type has not been matched exactly but it is possibly a form of *O. imbricatum* L., a species which, according to the view of T. Norlindh, is extremely variable. The type differs from all other specimens examined by the absence of the characteristic glandular hairs on the peduncle and pedicels.

Senecio arabadifolius O. Hoffm. ex O. Kuntze, p. 171.—Cape Province; Molteno.

The type agrees well with *Flanagan* 2726 (collected between Cala and Encobo) and *Dieterlen* 1073 (Basutoland) but is slightly more glandular-pubescent than these and in this respect differs from the closely allied species *S. pseudorhyncholaenus* Thell. 1923, which, however, might, with reason, be considered as only a form of *S. arabadifolius*.

Senecio cathcartensis O. Hoffm. ex O. Kuntze, p. 172.—Cape Province; Cathcart.

The type was not matched exactly, but approaches closely to *S. rubescens* Ait. Features of importance are the long-petioled basal leaves and the glabrous leaves and achenes.

Senecio colensoensis O. Hoffm. ex O. Kuntze, p. 172.—Natal; Colenso.

This appears most nearly allied to *S. pentactinus* Klatt. It is matched closely in the Natal Herbarium, Durban, but not in the Nat. Herb. Pretoria.

Senecio fibrosus O. Hoffm. ex O. Kuntze, p. 174.—Cape Province; East London.

S. pachythelis Phill. & Smith in Rep. Vet. Serv. & Anim. Ind. S. Afr. 1931, 640.

This is another species extracted from the *S. albanensis* complex.

Senecio Kuntzei O. Hoffm. ex O. Kuntze, p. 175.—Natal; Van Reenen's Pass.

S. glaberrimus DC. Prod. 6, 403 (1837).

The Kuntze type agrees with several authentically named specimens in the Nat. Herb. Pretoria.

Senecio lunayaeifolius O. Hoffm. ex O. Kuntze, p. 175.—Natal; Highlands Station.

S. paucicalyculatus Klatt in Bull. Herb. Boiss. 4, 468 (1896).

The label on the type bears the name *S. launaeifolius* O. Hoffm.

Senecio subbrubiflorus O. Hoffm. ex O. Kuntze, p. 178.—Natal; Van Reenen's Pass.

S. viscidus N.E. Br. in Kew Bull. 1901, p. 125.

This species is closely allied to *S. rhyncholaenus* DC., *S. arubidifolius* O. Hoffm. and *S. pseudo-rhyncholaenus* Thell. mentioned above. It differs from all these in the slightly larger capitula with more exserted florets. It has not been matched exactly in the Nat. Herb. Pretoria, but there is a number of specimens, including Wood 5221, from Mooi River, which are considered equal to it. There is no doubt that the species mentioned above and their allies require very careful study with a view to a revision. The value of characters such as colour of flower, habit, etc., for species delimitation must be given special attention.

CAMPANULACEAE.

Dortmannia decurrentifolia O. Kuntze, p. 187.—Cape Province; East London.

Lobelia Erinus Linn. var.

L. Erinus Linn. var. *bellidifolia* Sond. in Fl. Cap. 3, 544 (1864–1865) in part at least.

A decision whether to recognise several closely allied species to *L. Erinus*, or to regard the latter as a composite species with several varieties is left for a monographer to decide. There are several older epithets than *decurrentifolia* to be taken into account in this complex.

Dortmannia vanreenensis O. Kuntze, p. 188.—Natal; Van Reenen's Pass.

Lobelia patula L.f. Suppl. 1781, 395.

The Kuntze type agrees with several specimens in the Nat. Herb. Pretoria, which are apparently correctly named.

Lightfootia corymbosa O. Kuntze, p. 188.—Natal; Krantzklouf.

L. Huttoni Sond. in Fl. Cap. 3, 556 (1864–1865).

The Kuntze type is evidently only a slightly more robust form than the typical form of *L. Huttoni*.

EBENACEAE.

Royena Guerkei O. Kuntze, p. 196.—Natal; Charlestown.

The type specimen is somewhat defoliated but the leaves that are present, and the fruit preserved in a capsule are matched very closely by several specimens in the Nat. Herb. Pretoria. They are probably not specifically distinct from specimens referred to *R. ambigua*.

by Hiern in Fl. Cap. 4, 1. 457 (1906), not of Vent. It might be contended that these represent forms of *R. pallens* Thunbg., but in the present uncertain state of our knowledge of this group it seems advisable to retain *R. Guerkei* with specific rank.

Royena Simii O. Kuntze, p. 196. p.—Cape Province; Kingwilliamstown.

BORAGINACEAE.

Heliotropium Kuntzei Guerke ex. O. Kuntze, p. 205.—Cape Province; Modder River Station.

H. lineare (E. Mey.) C. H. Wright in Fl. Cap. 4, 2.9 (1904).

Although Wright did not include the name *H. Kuntzei* in his account of the genus, l.c.7., the Kuntze type agrees very closely with specimens named *H. lineare* by him.

SCROPHULARIACEAE.

Harveya cathcartensis O. Kuntze, p. 234.—Cape Province; Cathcart.

H. speciosa Bernh. ex Krauss in Flora 1844, 831.

The anthers of the type specimen of *H. cathcartensis* have only one developed anther theca, which is a characteristic feature of *H. speciosa*. Although the type of *H. cathcartensis* has a more congested inflorescence than is usual for *H. speciosa* it is not considered specifically distinct from it.

Limosella longiflora O. Kuntze, p. 235.—Natal; Van Reenen's Pass.

L. lineata Glk. in Bot. Jahrb. 66, 555 (1934).

L. aquatica auctorum non Linn.

L. tenuifolia auctorum non Nuttall.

L. aquatica var. *tenuifolia* auctorum nec Wolff nec Hoffm.

Glück, l.c., 556, retained *L. longiflora* O. Kuntze as distinct from his *L. lineata*, apparently basing his conclusion on Kuntze's description. The distinction drawn is the strongly 5-nerved calyx of the former. The nervation is certainly more pronounced in the Kuntze type than in most specimens of *L. lineata* in the Nat. Herb. Pretoria, but even on the Kuntze type the nervation is not uniformly conspicuous and in some flowers it is no more so than in some specimens of *L. lineata*. For this reason the name *L. longiflora* is adopted.

Nycterina Microsiphon O. Kuntze, p. 238.—Natal; Van Reenen's Pass.

Zaluzianskya Microsiphon K. Schum. in Just. Jahresb. 24, I. 395, Hiern in Fl. Cap. 4, 2.344 (1904).

The type specimen consists of a stout perennial herbaceous plant broken into two pieces, the basal portion having been detached from the rootstock. The terminal portion was evidently damaged during or prior to the flowering period, resulting in the production of ten or more lateral branches, each bearing flowers in the axils of the upper bracts. Three flowers were dissected, two of which were found to have been damaged by insects, the other however, contained two stamens and two staminodes. The specimen was not matched in the Nat. Herb. Pretoria.

LABIATAE.

Plectranthus Kuntzei Guerke ex O. Kuntze, p. 260.—Natal; Clairmont.

The type specimen appears to be specifically equal to a specimen of Wood 3390 named at Kew as *P. petiolaris* E. Mey. and cited in Fl. Cap. 5, I. 272 (1910). Wood 3390, however, is much more slender than a duplicate of *Rudatis* 339 (identified as *P. petiolaris* E. Mey.)

from Alexandra County, Natal, which is much nearer to the type locality of *P. petiolaris* in Pondoland. There is some measure of doubt, therefore, whether *P. Kuntzei* is conspecific with *P. petiolaris* and it is not deemed profitable to make a dogmatic statement on the issue in the light of inadequate records.

P. parviflorus Guerke ex O. Kuntze, p. 261.—Cape Province; East London.

P. strigosus Benth. ex E. Mey. Comm. 229 (1837).

As suggested in a note under *P. parviflorus* in Fl. Cap. 5, I. 281 (1910), the above synonymy appears well justified.

Stachys Kuntzei Guerke ex O. Kuntze, p. 262.—Natal; Van Reenen's Pass.

This species is retained by Skan in Fl. Cap. 1.c. 344.

POLYGONACEAE.

Oxygonum delagoense O. Kuntze, p. 268.—Delagoa Bay.

This species is retained by Wright in Fl. Cap. 5, I. 461 (1912). The classification of specimens in this genus is largely dependent on fruiting material and this is rarely satisfactorily preserved. The Kuntze type specimen is now without fruits and the type of his variety *robustum* is without either flowers or fruits.

PROTEACEAE.

Protea conchiformis O. Kuntze, p. 278.—Cape Province; Caledon.

Leucadendron venosum R. Br. in Trans. Linn. Soc. 10, 59 (1811); Phill. & Hutch.

in Fl. Cap. 5, I. 720 (1912).

There are two specimens in the Kuntze collection named *Protea conchiformis*, the type from Sir Lowry's Pass, 200 m. alt., 20-I-1894, and the other from 350 m. alt. 22-I-1894. The latter appears to be *Leucadendron grandiflorum* R. Br. but no fruit is available to confirm this suggestion.

Protea xanthoconus O. Kuntze, p. 278.—Cape Province; Caledon.

Leucadendron salignum B. Br. in Trans. Linn. Soc. 10, 62 (1811).

L. xanthoconus (O. Kuntze), K. Schum. in Just. Jahresb. 26, I. 364.

It is suggested in Fl. Cap. 5, I. 721, that the Kuntze specimen is equal to either *L. uliginosum* R. Br. or *L. salignum* R. Br. No male flowers are present on the Kuntze type and it is difficult to decide to which of these two species it should be referred. It agrees well, however, with a specimen collected in the same district, namely Caledon, by T. J. Stokoe, which has a glabrous male perianth-tube and which agrees closely in other essential respects with *L. salignum*.

Scolymocephalus lanuginosus O. Kuntze, p. 279.—Natal; Van Reenen's Pass.

Protea Rouppelliae Meisn. in DC. Prod. 14, 237 (1856); Phill. & Stapf in Fl. Cap. 1.c. 573 (1912).

THYMELAEACEAE.

(With the assistance of M. Moss.)

Gnidia Kuntzei Gilg ex O. Kuntze, p. 280.—Cape Province; Middelburg Road.

C. H. Wright in Fl. Cap. 5, 2. 70 (1915) cites *G. Kuntzei* Gilg as a synonym of *Lasiosiphon microphyllus* Meisn., but the type of the latter, a Drège specimen, was collected near the mouth of the Orange River in the Richtersveld and is now considered specifically distinct from the Kuntze specimen and others cited by Wright, 1. c., from the Middelburg and adjacent districts.

Gnidia phaeotricha Gilg ex O. Kuntze, p. 281.—Natal; Van Reenen's Pass.

G. gymnostachya (C. A. Mey.) Gilg var. **phaeotricha** M. Moss comb. nov.

Arthrosolen phaeotrichus (Gilg) C. H. Wright, l. c. 8.

The type of *Gnidia phaeotricha* is without flowers but a comparison of it with several authentically named specimens supports the above classification.

Gnidia polyclada Gilg ex O. Kuntze, p. 281.—Cape Province; Aliwal North.

Arthrosolen polycephalus (E. Mey.) C. A. Mey. in Bull. Phys. Math. Acad. Petersb. I. 359 (1845); Wright, l. c. 4.

Gnidia pretoriae Gilg ex O. Kuntze, p. 281.—Transvaal; Pretoria.

Gnidia sericocephala (Meisn.) M. Moss, comb. nov.

Arthrosolen sericocephalus Meisn. in DC. Prod. 14, 561 (1857); Wright, l. c. 5.

EUPHORBIACEAE.

Claoxylum? *sphaerocarpum* O. Kuntze, p. 284.—Natal; Clairmont.

Croton sylvaticus Hochst. ex Krauss in Flora 1845, 82; Prain in Fl. Cap. 5, 2. 413 (1920).

Euphorbia laxiflora O. Kuntze, p. 286.—Cape Province; East London.

E. bubalina Boiss. Cent. Euphorb. 26, and in DC. Prodr. 15, 2. 90 (1862); N.E.Br. in Fl. Cap. 5, 2. 335 (1915).

Jatropha Woodii O. Kuntze, p. 287; Prain l. c. 425—Natal; Ladysmith.

Ricinocarpus depressinervius O. Kuntze, p. 291.—Natal; Mooi River Station.

Acalypha depressinervius (O. Kuntze) K. Schum. in Just. Jaresbr. 26, I. 348; Prain l. c. 479.

Sapium Simii O. Kuntze, p. 293; Prain l. c. 514.—Cape Province; Pirie.

Tragia Bolusii O. Kuntze, p. 293.—East Griqualand; Clydesdale.

T. Meyeriana Müll. Arg. in DC. Prodr. 15, 2. 938 (1866); Prain l. c. 508.

Tragia durbanensis O. Kuntze, p. 293; Prain l. c. 510—Natal; Durban, Bluff.

IRIDACEAE.

Gladiolus pretoriensis O. Kuntze, p. 308.—Transvaal; Pretoria.

Gladiolus tritoniaeformis O. Kuntze, p. 308.—Natal; Howick.

G. crassifolius Baker in Journ. Bot. 1876, 334.

Identification by G. J. Lewis.

AMARYLLIDACEAE.

Hessea Schlechteri O. Kuntze, p. 310.—Natal; Mooi River.

Nerine pancratioides Baker in Gard. Chron. 1891, 576.

N. Schlechteri Baker sp. nov. in Bull. Herb. Boiss. ser. 2, 3. 665 (1903).

Identification by W. F. Barker.

LILIACEAE.

Aloe cascadiensis O. Kuntze, p. 313.—Cape Province ; East London.

A. striatula Haw. in Phil. Mag. 1825, 281.

This identification is suggested by Berger in Das Pflanzenf. 1908, 261. G. W. Reynolds who examined the type (which is very poor) qualified his agreement by stating that he did not know *A. striatula* from near East London but only in the mountains further inland.

Aloe transvaalensis O. Kuntze (*transvaalensis*) p. 314 ; Berger l.c., ; Transvaal ; Pretoria.

Asparagus spinosissimus O. Kuntze, p. 315.—Cape Province ; Cathcart.

This is matched by *Galpin* 2095 from near Queenstown. It is closely allied to *A. suaveolens* Burch.

Phalangium tenuifolium O. Kuntze, p. 317.—Cape Province ; Caledon.

Bulbine tenuifolia Baker ex O. Kuntze l.c.

The type specimen is very poor ; the inflorescence has been reduced to a few young buds. It was not matched in the Nat. Herb. Pretoria.

RESTIACEAE.

Thamnochordus maximus O. Kuntze, p. 330.—Cape Province ; near Cape Town.

Thamnochortus spicigerus (Thunb.) R.Br. Prod. 224 (1810) ; N. S. Pillans in Trans. Roy. Soc. 16, 383 (1928).

SOUTH AFRICAN ASCOMYCETES IN THE NATIONAL HERBARIUM.

By Ethel M. Doidge.

PART V.

During recent years, a number of South African fungi have been studied critically by workers in Europe, and detailed descriptions published in the *Annales Mycologici* and elsewhere; in many cases changes in nomenclature have been made. It seems desirable that this work should be readily available to South African mycologists, and an indication given of the material of such fungi which is available for study.

In the present paper, descriptions are given of a number of fungi which have been studied in this way, the descriptions being translated freely and adapted from the work quoted in each case. A number of original descriptions of fungi apparently undescribed or hitherto unrecorded from South Africa, are also included. I am indebted to Dr. H. Sydow for help with some of the critical species, and especially for comparing South African material with types available in Europe.

The last paper of this series was Part IV, published in *Bothalia* Vol. 2 (1927) pp. 229-241; it included descriptions of ascomycetes numbered 136-159.

160. *Irene Ekebergiae* Doidge nov. sp.

Plagulae amphigenae, sparsae, orbiculares v. irregulares, 1-2 mm. diam.; mycelium reticulatum ex hyphis undulatis, fuscis usque brunneis, 7.5-10 μ latis, septatis (articulis 12-35 μ longis) oppositè ramosis compositum; hyphopodia capitata alternata, recta, curvata v. uncinata, 15-35 μ longa, cellula basali cylindracea v. gibbosa, 5-12.5 μ longa, cellula superiore clavata, cylindracea v. irregulare, saepe sublobata, 10-17.5 μ lata; hyphopodia mucronata numerosa, plerumque opposita, haud pallidiores, 20-25 μ longa, ampullacea, e basi ventricosò-dilatata, 8-10 μ lata, subito in collum longiusculum rectum, obliquum v. curvatum 3-4 μ latum attenuata; perithecia sparsa, globosa, atra, 120-160 μ diam., cellulis parietis convexis; asci non visi; sporae ellipsoideae, 4-septatae, brunneae, utrinque rotundatae, constrictae, 47-58 \times 22-27.5 μ .

Hab. in foliis *Ekebergiae pterophyllae* Hofmeyr, Lydenburg, leg. Keet, 28909.

Colonies amphigenous, scattered, isolated or subconfluent, often more numerous on the lower surface of the leaf, dense, black, small, round to irregular in outline, 1-2 mm. diam. Mycelium reticulate, often forming a dense network, especially near the centre of the colony. Hyphae undulating to tortuous, at first pale fuscous, soon becoming fuscous, and older hyphae are dark reddish brown [Natal brown (*Ridgway)]; hyphae 7.5-10 μ thick, usually rather densely branched, cells 12-35 μ long; branches mostly opposite, less frequently irregular, anastomosing freely. Capitulate hyphodia alternate or unilateral, fairly numerous, straight, curved or uncinata, 15-35 μ long; basal cell cylindrical or gibbous, straight or curved, 5-12.5 μ long, 6-10 μ thick; apical cell very variable in form, clavate, cylindrical or irregular, often sublobed, rounded or flattened at the apex, 10-17.5 μ broad. Mucronate

*Ridgway colour standards and nomenclature, Washington, 1912.

hyphopodia very numerous, especially near the centre of the colony, on separate branches or interspersed with the capitate hyphopodia, usually opposite, not paler than the hyphae, flask-shaped, 20–25 μ long, 8–10 μ thick at the swollen base, narrowing suddenly into a rather long neck, which is straight, oblique or curved and 3–4 μ thick. Perithecia (not mature) scattered, black, globose, 120–160 μ diam., outer wall composed of convex cells; the perithecia would probably be larger when mature. Asci not seen. Spores ellipsoid, 4-septate, broadly rounded at both ends, constricted at the septa, 47–58 μ long; central cell 22–27.5 μ broad, tapering slightly towards the ends.

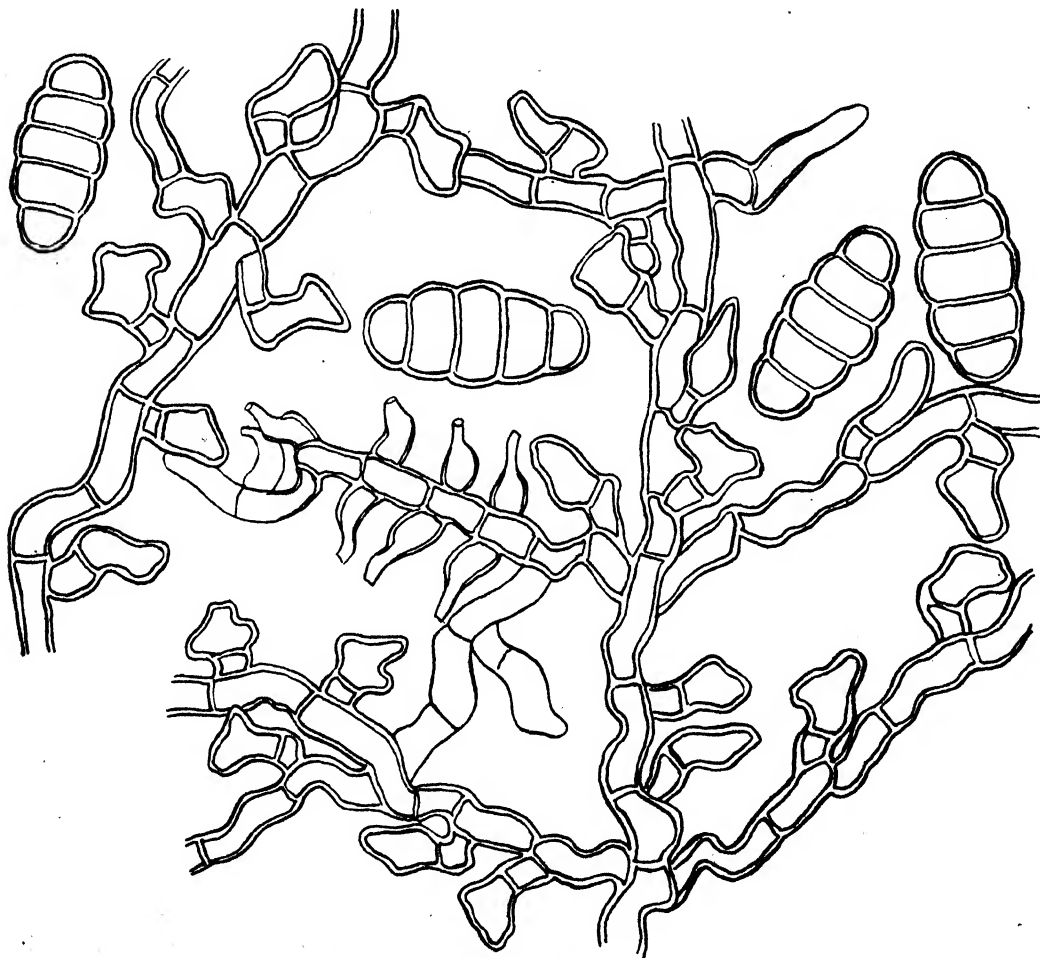


FIG. 1.—*Irene Elsebergiae*. Spores, and hyphae with capitate hyphopodia and mucronate hyphopodia.

On leaves of *Ekebergia pterophylla* Hofmeyr, Lydenburg, Transvaal, Keet, 28909.

161. *Meliola Acridocarpi* Doidge nov. sp.

Plagulae semper epiphyllae, irregulariter sparsae, atrae, orbiculares v. plus minus irregulares, usque 4 mm. diam. Mycelium ex hyphis plus minus dense reticulato-ramosis, rectiusculis, septatis, pellucide brunneis, 7.5–8 μ crassis compositum. Hyphopodia capitata numerosa, alternantia, rarius unilateralia, 18.5–24 μ alta;

cellula basali cylindracea, $3.75-6\ \mu$ longa et $7.5-10$ lata; cellula apicali integra, ovata v. globulosa, $12.5-15\ \mu$ diam. Hyphopodia mucronata numerosa, opposita v. alternantia, lageniformia, $16-23\ \mu$ longa, in parte inferiore $8.5-10\ \mu$ lata, sursum sensim vel e medio abrupte in collum attenuata. Setae myceliales nullae. Perithecia in centro plagarum aggregata, globosa, verrucosa, atra $150-200\ \mu$ diam., pariete membranaceo e cellulis $13-18\ \mu$ diam. irregulariter angulosis extus conico-prominulis composito. Setae peritheciales paucae (5-12) sat rigidae, septatae, $75-100\ \mu$ longa, inferne brunneae, subopacae, $10-12\ \mu$ crassae, sursum sensim leniterque attenuatae et dilutiores, ad apicem scabrae, rectae v. uncinatae, $5-6.5\ \mu$ crassae. Asci 2-3-sporei ovati v. ellipsoideae. $60-65 \times 17.5-25\ \mu$, sacile diffuentes. Sporae oblongae, utrinque haud vel leniter tantum attenuatae, late rotundatae, leniter constrictae, pellucide brunneae, $40-45 \times 15-16\ \mu$.

Hab. in foliis *Acridocarpus natalitii* Juss., Oribi Gorge, prope Port Shepstone, leg. McClean, 31054.

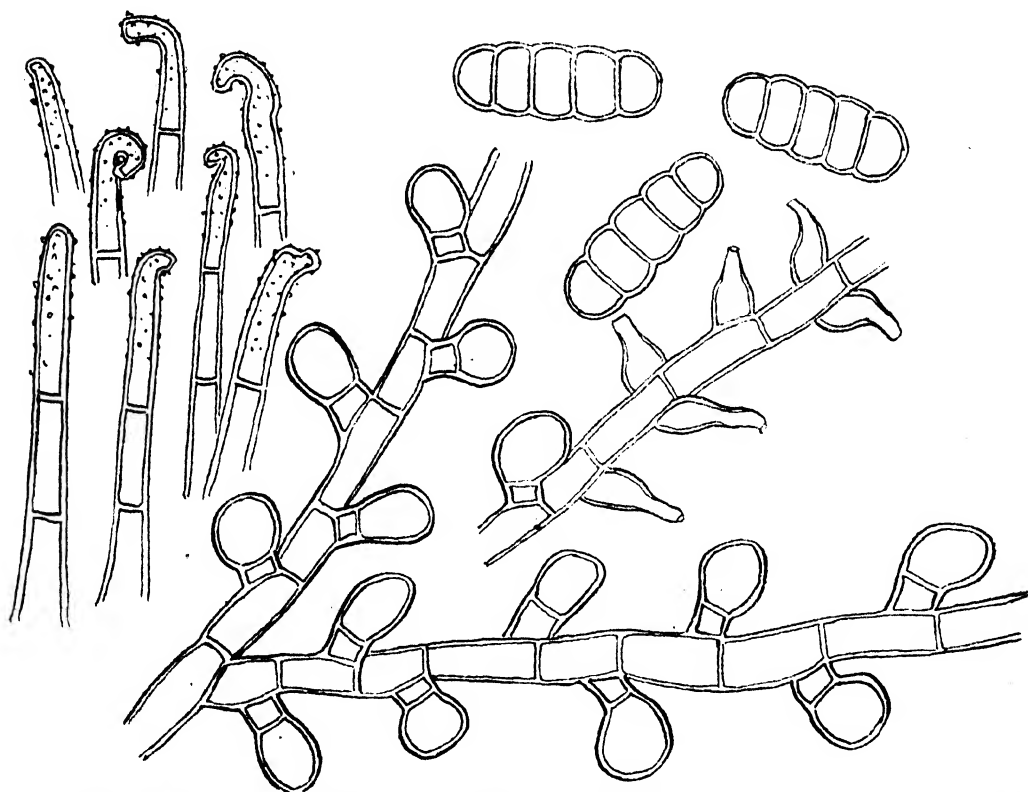


FIG. 2.—*M. Acridocarpi*. Spores, tips of perithecial setae, and hyphae with capitate and mucronate hyphopodia.

Colonies epiphyllous, scattered, more or less circular or irregular, up to 4 mm. diam., dense, dull black. Mycelium more or less closely reticulate, brown (tawny olive to sayal brown or snuff brown, Ridgway) pellucid. Hyphae usually straight, mostly $7.5-8\ \mu$ thick, rarely up to $10\ \mu$, with cells $15-20\ \mu$ long, branching freely; branches opposite or irregular. Capitate hyphodia alternate or unilateral; often rather regularly alternate, one to each cell of the hypha, but more or less irregular where the mycelium is closely reticulate; mostly inclined forward at an angle of ca. 45° with the hyphae, $18.5-24\ \mu$ long; basal cell short, cylindrical, $3.75-6\ \mu$ long and $7.5-10\ \mu$ broad; apical cell sub-globose to ovate, entire,

12.5–15 μ diam., rarely flattened or irregular through contact with neighbouring hyphopodia or hyphae. Mucronate hyphopodia numerous, on separate short branches or interspersed with the capitate hyphopodia, not paler than the hyphae, opposite or alternate, lageniform, 16–23 μ long, 8.5–10 μ broad at the base, narrowing suddenly or rather gradually into a neck which is more or less curved, rarely straight, about half the total length of the hyphopodium and 3.5–4 μ thick. Mycelial setae none. Perithecia closely crowded in the centre of the colony, black, carbonaceous, globose, verrucose, 150–200 μ diam.; wall membranous, formed of cells 13–18 μ diam., more or less angular, convex or conical at the surface. Perithecial setae 5–12, rigid, septate, 3–4-celled, 75–100 μ long, dark brown, sub-opaque, 10–12 μ thick at the base, tapering somewhat to the apex which is lighter brown, pellucid, obtusely rounded, 5–6.5 μ thick, straight, bent or uncinat; apical cell scabrous. Asci 2–3-spored, ellipsoid or ovate, rounded above, sessile or sub-pedicellate, 60–65 \times 17.5–25 μ , evanescent. Spores 4-septate, oblong, more or less constricted at the septa, not tapering, or tapering very slightly to broadly rounded ends, mostly 40–45 \times 15–16 μ , rarely up to 47.5 μ long and 17.5 μ broad.

on leaves of *Acridocarpus natalitius* Juss., Oribi Gorge, near Port Shepstone, Natal, McClean, 31054; Inanda, Natal, Medley Wood 575, 9514, 10357.

Closely related to *Meliola claviculata* Doidge, from which it differs in habit, the opaque perithecia, the septate perithecial setae and longer spores.

162. *Meliola Impatientis* Doidge nov. sp.

Plagulae amphigenae, plerumque epiphyllae, atrae, minutae, irregulares v. orbiculares, usque 2.5 μ diam.; mycelium ex hyphis fuscis, undulatis, 6–8 μ latis, septatis (articulis 15–25 μ longis) laxae ramosis compositum; hyphopodia capitata numerosa, alternantia, 17–23 μ longa, cellula basali cylindracea, 4–6 μ longa, superiore subglobosa, plus minus lobata v. truncata, latiore quam longa, 12–17.5 μ lata; hyphopodia mucronata sat numerosa, plerumque in centro plagularum evoluta, opposita v. alternata, ampullacea, collo brevi recto v. curvato, 20–25 μ longa, basi 6–8 μ lata; setae myceliales sat numerosae, praecipue juxta perithecia evolutae, simplices, ad basim geniculatae, rectae v. leniter incurvae, 250–350 μ longae, basi atro-brunneae, subopacae, 8–9 μ crassae, sursum ad apicem obtusum v. sub-acutum subpellucidum sensim attenuatae; perithecia sparsa, atra, subglobosa, 160–220 μ , daim., cellulis parietis convexis; asci 2–4 spori, fugaces; sporae brunneae, cylindraceae utrinque rotundatae, 4-septatae, ad septa leniter constrictae, 35–40 \times 12–15 μ .

Hab. in foliis *Impatientis capensis* Meerb., Woodbush, leg. Morgan et Doidge, 28348.

Colonies amphigenous, mostly epiphyllous, discrete or subconfluent, minute, rather thin, black, round to irregular in outline and up to 2.5 mm. in diameter. Mycelium radiating or loosely reticulate. Hyphae pale fuscous to olive brown, more or less undulating, 6–8 μ thick, cells 15–25 μ long; branches distant, usually alternate. Capitate hyphopodia numerous, alternate or unilateral, 17–23 μ long, mostly at an angle of about 45° with the hyphae; basal cell cylindrical 6–8 μ thick, usually 4–6 μ long, very rarely up to 15 μ long; apical cell subglobose to irregular, often bluntly angular, truncate or with 2–3 shallow, rounded lobes, often broader than long, 12–17.5 μ broad. Mucronate hyphopodia numerous in the older part of the colony, produced on special hyphal branches, opposite or alternate, paler than the hyphae, ampulliform, 20–25 μ long, 6–8 μ diameter at the base, tapering rather gradually into a short neck which is straight or curved. Mycelial setae produced mostly in the neighbourhood of the perithecia, fairly numerous, simple, geniculate near the base, straight or slightly incurved, 250–300 μ long; dark brown, subopaque and 8–9 μ thick at the base, tapering gradually towards the apex which is somewhat paler, pellucid, obtuse or occasionally subacute. Perithecia scattered, black, globose, 160–220 μ diam., cells of the outer wall convex. Asci 2–4-spored, disappearing early. Spores olive brown, cylindrical, 4-septate, slightly constricted, broadly rounded at both ends.

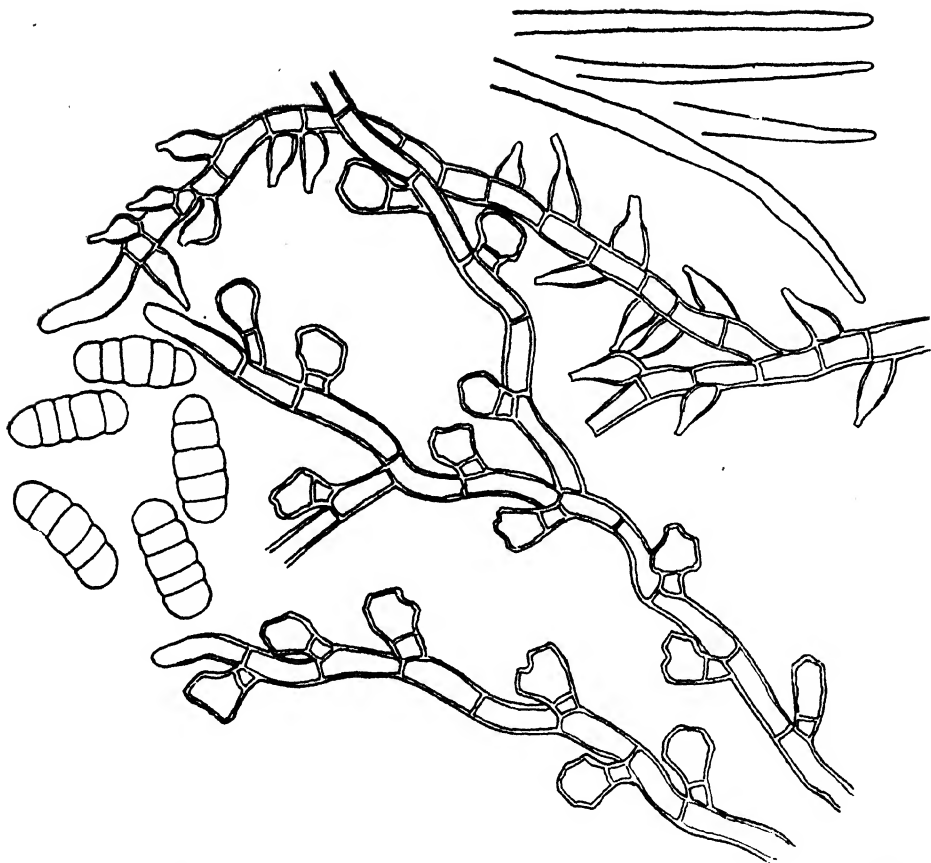


FIG. 3.—Spores, tips of mycelial setae, and hyphae with capitate and mucronate hyphopodia.

On leaves of *Impatiens capensis* Meerb., Woodbush, Pietersburg District, Transvaal, Morgan and Doidge, 28348.

163. *Meliola jasminicola* P. Henn.

Hedwigia 34 (1895) p. 11; Stevens, Ann. Myc. 26 (1928) p. 257.

Colonies amphigenous, mostly epiphyllous, also on the petioles, not causing leaf spots, irregularly scattered, dull black, more or less round, 1–3 mm. diam.; when numerous becoming confluent and forming larger, irregular blotches. Mycelium more or less reticulate, rather densely so in the older part of the colony, composed of cinnamon brown hyphae which are straight or somewhat undulating, mostly 7–8 μ thick, in places up to 10 μ ; cells mostly 20–30 μ long; branches fairly numerous, mostly opposite and at an acute angle with the main hyphae. Capitate hyphopodia numerous, alternate, unilateral or opposite,

2-celled, broadly clavate, rarely cylindrical, straight or slightly curved, mostly inclined forward towards the hypha, 17–23 μ long; basal cell cylindrical, 5–8 μ long, 7–8 μ broad; apical cell ovate to cylindrical, entire, broadly rounded above, 9–10 μ broad. Mucronate hyphopodia numerous in the older parts of the colony, on separate hyphal branches or interspersed with the capitate hyphopodia, usually opposite, not paler than the hyphae, flask-shaped, 17–20 μ long, 7–8 μ broad at the base, narrowing suddenly or rather gradually into a curved or oblique neck, about equal in length to the swollen base and 2.5–3.5 μ thick. Mycelial setae not very numerous, scattered, but more numerous in the neighbourhood of the perithecia, simple, straight, 400–600 μ long; opaque, black, 8–12 μ thick at the base, tapering gradually upwards to the dark brown, somewhat translucent apex. Perithecia not numerous, grouped in the centre of the colony, black, globose, carbonaceous, surface cells slightly convex, 240–300 μ diam., Asci 2-spored, evanescent. Spores 4-septate, cylindrical, not tapering, or tapering slightly to broadly rounded ends, constricted at the septa, 35–50 \times 12.5–17.5 μ ; central cell usually slightly longer.

On leaves of *Jasminum streptopus* E. Mey., Springfield, Natal. *Medley Wood*, 31050.

This fungus was compared with a specimen of *M. jasminicola* collected by Merrill in the Philippines (Flora Philip. No. 7469) and identified by Sydow; it appears to be identical.

The spores are very variable in size; in the original description the measurements given are 30–36 \times 10–15 μ , and Stevens' group number (l.c.) 3111–3233 indicates that spores are 40 μ long or less. In the Philippine specimen examined, as well as in the South African collection they were frequently 40–45 \times 15 μ , and in the South African material spores up to 50 μ long were not uncommon.

164. *Meliola oleicola* Doidge var. *Jasmini* n. var.

Bothalia 2 (1928) p. 458.

A typo recedit hyphodiis (usque 25 μ longis) et sporidiis (35–40 \times 15–18 μ raro usque 42.5 μ longis) minoribus.

Hab. in foliis *Jasmini streptopi* E. Mey., Durban, leg. *Bottomley* 11379.

165. *Meliola perpusilla* Syd. var. *congoensis* Beeli.

Bull. Jard. Bot. Etat Bruxelles 7 (1920) p. 97; Sacc. Syll. Fung. XXIV (1926) pp. 271, 272.

Colonies mostly epiphyllous, less frequently hypophyllous or caulicolous, scattered, small, up to 2 mm. diam., black, more or less circular, or when crowded becoming confluent. Mycelium radiating, tawny olive (Ridgway); hyphae 7.5–10 μ thick, straight or very slightly undulating; branching remote, usually opposite, cells 20–30 μ long. Capitate hyphopodia alternate or unilateral, cylindrical to sub-clavate, inclined forwards towards the hypha, mostly at an angle of ca. 45°, 17–25 μ long; basal cell short, cylindrical, 2–6 μ long, 7–9 μ broad; apical cell ovate, rounded above, 15–17 μ long and 9–10 μ broad. Mucronate hyphopodia not numerous, usually opposite, lageniform, 12–15 μ long, 7–8 μ broad at the base, narrowed above into a short neck ca. 4 μ thick. Mycelial setae not very numerous, straight or slightly curved, simple, 200–400 μ long, dark brown, sub-opaque, 8–10 μ thick at the base, tapering gradually upwards to the paler, translucent, subacute apex. Perithecia scattered, black, globose, 150–200 μ diam., surface cells slightly convex, Asci ovate, 2–4-spored, 40–50 \times 25–30 μ . Spores oblong, broadly rounded at both ends, 4-septate, slightly constricted at the septa, olive brown, 35–40 \times 12.5–16 μ .

on leaves of *Secamone frutescens* Decne., Karkloof, near Maritzburg, Natal, *Doidge*, 14958.

On comparison with a specimen of *Meliola perpusilla* Std. (No. 11423 in Baker's Fungi Malayana, det. Saccardo) the South African fungus was found to differ in the size of the perithecia and spores; these agreed in measurement with those of Beeli's var. *congoensis*.

166. *Meliola Ptaeroxyli* Doidge, nov. sp.

Plagulae amphigenae, irregulariter sparsae, orbiculares v. plus minus irregulares, atrae, usque 4 mm. diam.; mycelium ex hyphis fuscis rectiusculis ramosis, $7.5\text{--}12.5\ \mu$ crassis, breviter articulatis, torulosis compositum. Hyphopodia capitata numerosa, unilateralia v. alternantia, irregularia, $20\text{--}40\ \mu$ longa; cellula basali plerumque cylindracea, $5\text{--}12.5\ \mu$ longa et $6\text{--}9\ \mu$ lata; apicali cylindracea, ovata, clavata vel irregulariter 2-3-lobata, recta v. curvata, $10\text{--}18\ \mu$ lata. Hyphopodia mucronata saepe numerosa, variabilia, $20\text{--}27.5\ \mu$ longa, in parte infera $7.5\text{--}10\ \mu$ lata, e medio plerumque subito in collum cylindraceum, rectum obliquum v. curvatum transeuntia. Setae myceliales sat numerosae, rectae vel subrectae, usque $750\ \mu$ longae, ad basim $8\text{--}10\ \mu$ latae opace atrobrunneae, apicem versus sensim attenuatae et dilutiores, ad apicem obtusae, sub-acutae v. nonnunquam minute bi-denticulatae. Perithecia sparsa vel pauca aggregata, globosa, atra, $180\text{--}300\ \mu$ diam., verrucosa. Asci ovati, facile diffluentes, 2-3-spори. Sporae oblongae, 4-septatae, utrinque leniter attenuatae, late rotundatae, $50\text{--}60 \times 20\text{--}23\ \mu$.

Hab. in foliis *Ptaeroxyli obliqui* (Thun.) Radkb., in silvis Marwaqa, prope Bulwer, Natal, leg. Morgan et Doidge 30899.

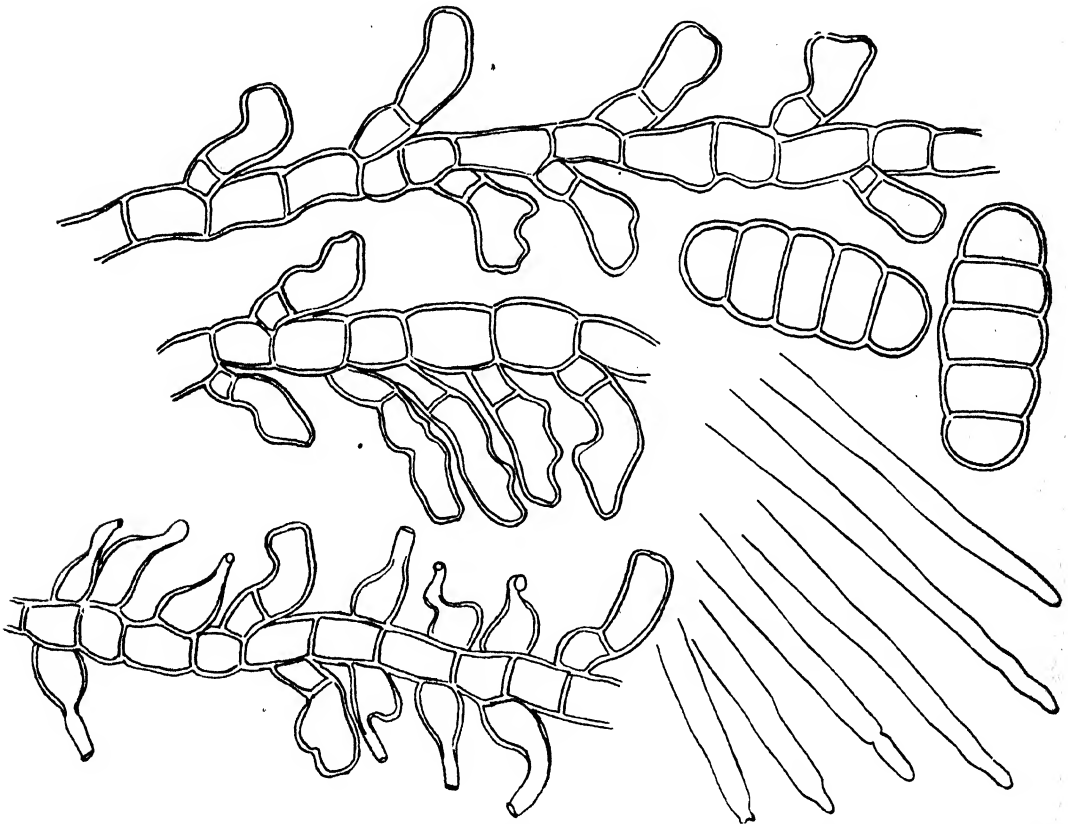


FIG. 4.—*Meliola Ptaeroxyli*. Spores, tips of mycelial setae, and hyphae with capitate and mucronate hyphopodia.

Colonies amphigenous, scattered, on indefinite brownish leaf spots, up to 4 mm. diam. Mycelium radiating, formed of tawny olive (Ridgway) hyphae, which are usually straight, torulose, $7.5\text{--}12.5\ \mu$ thick, with very short cells $7.5\text{--}12.5\ \mu$ long, often constricted at the septa; freely branched, branches often opposite. Capitata hyphopodia unilateral or

alternate, irregular in form and size, straight or sinuous, 20-40 μ long; near the centre of the colony often closely crowded, with series of 3-5 or more on one side of the hypha; nearer the margin often more regularly alternate, and on some branches distant; usually inclined forward, forming an acute angle with the hypha; basal cell usually more or less cylindrical, straight or bent, rarely irregular, 5-12.5 μ long, usually 6-9 μ broad, rarely ventricose and up to 12.5 μ ; apical cell cylindrical, ovate, clavate, or sub-lobed and irregular in outline, rounded or truncate at the apex, straight, curved or bent, entire or with 2-3 obtuse shallow lobes, 10-18 μ broad. Mucronate hyphopodia numerous in some colonies, interspersed with the capitate hyphopodia, mostly opposite, but occasionally alternate or unilateral, not paler than the hyphae, lageniform, straight, gibbous or curved, 20-27.5 μ long, 7.5-10 μ broad at the more or less swollen base, constricted into a neck about half the entire length of the hyphopodium and ca. 3.5 μ thick, direct or oblique, more or less curved. Setae fairly numerous, straight, up to 750 μ long; blackish brown, opaque, 8-10 μ thick at the base; tapering upwards to the apex, which is brown, more or less pellucid, 2.5-4 μ thick, simple, rounded or sub-acute, frequently constricted or sub-torulose near the tip and occasionally minutely bidentate. Perithecia not very numerous, scattered or more or less grouped, black, globose, 180-300 μ diam.; surface cells strongly convex, 15-25 μ diam. Asci 2-3-spored, ovate. Spores 4-septate, oblong, constricted at the septa, tapering slightly to broadly rounded ends, 50-60 \times 20-23 μ .

on leaves of *Ptaeroxylon obliquum* (Thunb.) Radkl., Marwaqa Forest near Bulwer, Natal, *Morgan* and *Doidge*, 30899; Buccleuch, near Maritzburg, Natal, *Doidge*, 9715.

167. *Meliola xumenensis* Doidge nov. sp.

Plagulae epiphyllae, dispersae, tenues, atro-griseae, irregulares v. orbiculares usque 3 mm. diam. Mycelium laxè reticulatim ex hyphis ramosis, plus minus undulatis, septatis, olivaceo-brunneis, plerumque 6-8 μ latis compositum. Hyphopodia capitata modice copiosa, alternantia v. unilaterialia, 27.5-45 μ alta; cellula basali cylindræa, variae longitudinis, 6-12 μ longa et 7-7.5 μ lata; cellula apicali cylindræa, uncinata v. sinuosa, rarissime recta, 10-12.5 μ lata, vel irregulariter 2-3-lobata, 20-23 μ lata. Hyphopodia mucronata plerumque opposita, haud pallidiores, 20-25 μ longa, parte infera 6-9 μ lata, e medio sensim, raro subito in collum tenuiorem transeuntia. Setae myceliales simplices, rectae, v. sub-rectae, 300-600 μ longae; ad basim 6-9 μ crassae, atrae opacae, apicem brunneum sub-pellucidem versus sensim attenuatae. Perithecia laxè aggregata, globosa, atra, scabra, 180-200 μ diam. Asci 2-spори. Sporae 4-septatae, cylindræae utrinque late rotundatae, ad septa leniter constrictae, 45-50 \times 17-19 μ .

Hab. in foliis *Jasmini streptopi* E. Mey., in silvis Xumeni, prope Donnybrook, Natal, leg. *Morgan* et *Doidge*, 29897.

Colonies epiphyllous, not on leaf spots, scattered, thin, greyish black, round to irregular in outline, poorly defined, up to about 3 mm. diam. Mycelium loosely reticulate; hyphae light brownish olive (Ridgway) more or less undulating, uneven in thickness, mostly 6-8 μ thick but up to 10 μ thick in places; cells mostly 25-40 μ long; branching rather remote opposite or alternate. Capitate hyphopodia fairly numerous, rather remote, alternate or unilateral, inclined forward towards the hypha or erect, 2-celled, 27.5-45 μ high; basal cell more or less cylindrical, 6-12.5 μ long, 7-7.5 μ broad; apical cell cylindrical to clavate with broadly rounded or truncate apex, curved, more or less uncinata or sinuous, abruptly bent, or rarely almost straight, 10-12.5 μ broad, or irregular with 2-3 rounded, rather shallow lobes and 20-23 μ broad. Mucronate hyphopodia fairly numerous in the older parts of the colony, on separate short branches or interspersed with the capitate hyphopodia, usually opposite, not paler than the hyphae, straight or slightly curved, 20-25 μ high 6-9 μ broad at the base, tapering gradually into a neck which is 3-4 μ thick at the apex, rarely constricted abruptly at the centre. Mycelial setae not very plentiful, more numerous round the base of the perithecia, simple, straight or slightly curved, 300-600 μ long; black, opaque, 7.5-9 μ thick at the base; tapering gradually upwards to the brown, more or less translucent

apex, which is rounded and usually ca. $3.5-4\ \mu$ thick. Perithecia fairly numerous, more or less grouped near the centre of the colony, black, globose, scabrous, $180-200\ \mu$ diam. Asci 2-spored, evanescent. Spores 4-septate, cylindrical, concolorous with the mycelium, broadly rounded at the ends, slightly constricted at the septa, $45-50 \times 17-19\ \mu$.

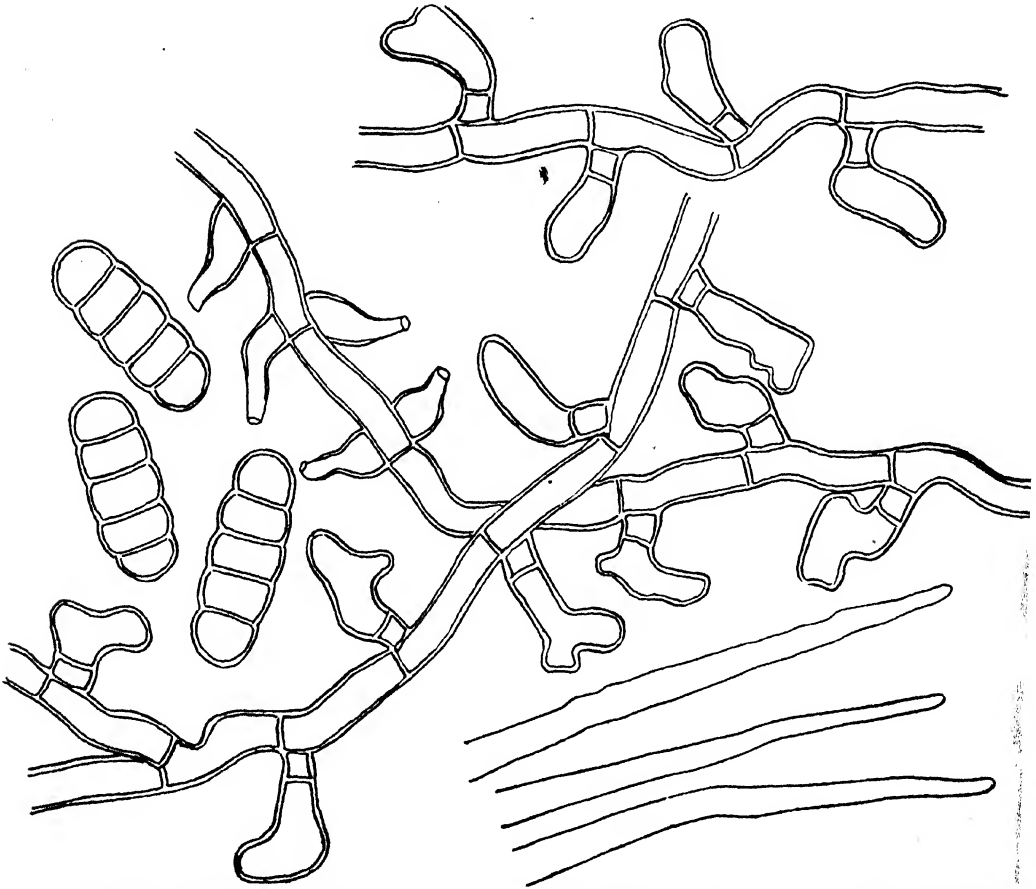


FIG. 5.—*Meliola Xumenensis*. Spores, tips of mycelial setae, and hyphae with capitate and mucronate hyphopodia.

on leaves of *Jasminum streptopus* E. Mey., Xumeni Forest, near Donnybrook, *Morgan* and *Doidge*, 29897; Karkloof, near Maritzburg, *Doidge* 14942.

In collection 29897, associated with *Meliola gemellipoda*, the latter occurring mostly on the stems.

168. *Meliola rhoina* Doidge.

Bothalia 2 (1928) p. 454.

on leaves of *Harpephyllum caffrum* Burch., East London, *Doidge*, 10926; Howieson's Poort, near Grahamstown, *Doidge*, 10958; Pirie Forest, Kingwilliamstown, *Doidge*, 12269, 22396; Marwaqa Forest near Bulwer, *Morgan* and *Doidge* 31899.

The *Meliola* sp. on *Harpephyllum caffrum* was not mentioned in the revision of the genus in *Bothalia* (loc. cit.) as its identity was doubtful. A careful study has now been made of a number of collections, and this fungus cannot be distinguished from *Meliola rhoina*, which is a very variable species.

In addition to the occurrences of *Melisia rhoina* on *Rhus* spp. previously recorded, it has been found on:—

Rhus MacOwani Schönl., Alexandria Forest, *Doidge* 22372;

Rhus natalensis Bernh., East London, *Doidge*, 22389.

169. *Physalosporina Sutherlandiae* (Kalch. et Cke.) Petrak
in *Ann. Myc.* 32 (1934) p. 411.

Syn. *Stigmatea Sutherlandiae* Kalch. et Cke. in *Grevillea* 9 (1880) 32; *Syll. Fung.* 1 (1882) 543.

Stigmatula Sutherlandiae (Kalch. et Cke.) Syd. in *Bull. Herb. Boiss.* 2, ser. 1 (1901) 78;
Syll. Fung. 16 (1902) 454.

Hyponectria Sutherlandiae (Kalch. et Cke.) Theiss.
in *Verhandl. Zool. Bot. Ges.* 69 (1920) 23.

Stroma extensive, usually spreading from the margins or the tips of the leaves, which show a yellowish or light yellowish-brown discoloration, and permeating the entire mesophyll at the leaf. Ground tissue of the stroma almost sclerotial in character, consisting of loose plectenchyma, formed of tortuous and interwoven hyphae which are very freely branched, rather closely septate, 3–6 μ thick, hyaline and comparatively thick-walled. Stromatal tissue developed most freely in the palisade cells, often interrupted by small irregular spaces and including shrunken vestiges of the substratum. Perithecia irregularly scattered, usually single; sometimes 2 or more, which are in close proximity become more or less confluent and form small, irregular groups; deeply immersed in the mesophyll, with a flat or slightly convex base seated on the flattened spongy parenchyma or slightly immersed in it; subglobose, ovate, slightly compressed, 200–300 μ diam. Ostioles short, thick, conical, punctiform-erumpent, about 80 μ high, traversed by a pore 20–30 μ broad, lined within with filamentous periphyses. Perithecial wall membranous to fleshy, usually 12–20 μ thick, composed of numerous layers of very strongly compressed cells, which are irregularly angular, thin-walled, 5–12 μ diam., hyaline or subhyaline in mass, becoming darker from the base of the ostiole to dark olive brown round the pore; fused outwardly with the tissue of the stroma and not sharply defined. Asci numerous, at first cylindrical, later more or less clavate or fusiform, broadly rounded above, tapering downwards into a short stalk, 8-spored, 60–75 \times 10–18 μ , with a thin delicate wall. Spores at first monostichous, then incompletely distichous, often transverse, broadly ellipsoid or ovate, broadly rounded at both ends, not tapering, straight, 1-celled, hyaline, 10–15 \times 7–9 μ . Paraphyses rather sparse, broadly filamentous, ca. 2–4 μ broad, very thin-walled, collapsing early and becoming mucilaginous and unrecognisable.

on dying leaves of *Sutherlandia frutescens* R. Br., Boschberg, near Somerset East, *MacOwan* 1415, 3684, 20846, 21978 (Rabh. *Fung. Eur.* 3344).

Petrak (loc. cit.) discusses at length the systematic position and synonymy of this fungus.

170. *Anthostomella Cassinopsidis* (K. et Cke.) Rehm.

Ann. Myc. 4 (1906) p. 341 and 5 (1907) p. 545, (erronee *A. Cassionopsidis*); *Sacc. Syll. Fung.* XXII (1913), p. 94.

Syn. *Diplodia cassinopsidis* Kalch. et Cke., *Grevillea* IX (1880), p. 19.

Sphaeropsis Cassinopsidis (Kalch. et Cke.) Pазsch., *Rabh. Fung. Eur.* 4488.

Anthostomella Cassinopsidis (Kalch. et Cke.) Petr. et Syd., *Ann. Myc.* 23 (1925) p. 216.

Perithecia more or less scattered, sometimes distant, sometimes close to one another, occasionally crowded; developing under the epidermis, which becomes raised, pustuliform,

with only the ostiole punctiform-erumpent; globose, black, very variable in size, usually ca. 300–500 μ diam., seldom somewhat larger; ostiole truncate-conical, traversed by a round pore. Perithecial wall mostly about 12–15 μ thick below; above it is fused with the outer wall of the epidermis, forming an epidermal clypeus which extends over and beyond the perithecium, and round its sides almost to the base; in this way the membrane at the sides becomes up to 75 μ thick, and when the perithecia are close together, these become fused and the single perithecia have the appearance of loculi sunk in a stroma. Asci cylindrical, thin-walled, broadly rounded above, tapering below into a rather short stalk, 8-spored, sp. part 100–120 \times 12–15 μ . Spores obliquely monostichous, elongate-ellipsoid or ovate, not tapering towards the broadly rounded ends or only slightly so, straight, rarely slightly curved, 1-celled, dark brown, almost opaque, 15–25 \times 8–12 μ . Paraphyses numerous, filamentous.

on stems of *Cassinopsis* sp., Cape, MacOwan, Rabenhorst-Pazschke, Fung. Europ. et extra-Europ. nr. 4488.

Rehm's species *Anthostomella Cassinopsidis* was described from a specimen collected by MacOwan and handed to him by Pazschke; his description agrees fairly well with that given by Petrak and Sydow of the fungus distributed by Pazschke as nr. 4488 of the Fungi europ. et extra-europ., and I think there is little doubt that it was part of the same collection.

In the *Annales Mycologici* 4 (1906) the name of the fungus was given as *An. Cassinopsidis* and the host *Cassinopsis* sp. So far as I am aware there is no such genus as *Cassinopsis*, and this was obviously a clerical error. The name of the host and the specific name of the fungus were given correctly in the *Sylloge Fungorum* (loc. cit.).

171. *Mycosphaerella Aloes* Syd.

in Ann. Myc. 37 (1939) 181.

Stromata amphigenous, but mostly epiphyllous, round to elliptic or irregular in outline in groups 2–4 mm. diam., appearing first near the tip of the leaf, later spreading gradually and evenly downwards and becoming ever more numerous; the areas of the leaf which are invaded become dead and dark brown in colour. Stromata developing chiefly in the epidermis, sometimes consisting of a single, very thick-walled perithecium on a short, broadly truncate, inverted-conical basal stroma; but usually the stroma is tuberculate, irregularly circular or elliptic in outline, formed by the fusion of 2–3 perithecia, of which the more or less flattened apices break through cracks in the epidermis; they are more or less convex below and sunk into the mesophyll, usually 150–250 μ diam., seldom somewhat larger. At the base the stroma attains to a thickness of 80 μ ; it becomes gradually thinner at the sides and is often only 18–25 μ thick at the apex; it is parenchymatous and consists of cells which are irregularly polyhedral, thin-walled, translucent, blackish-brown, 6–12 μ diam., running out at the base and at the sides into rather short-celled tortuous hyphae 3–5 μ thick, which penetrate more deeply into the substratum.

Perithecia globose, broadly ovate or rather irregular, 120–180 μ diam., seldom somewhat larger, provided with a papilla, which is traversed by a rather indefinite irregular pore. Asci few, seldom more than six in a perithecium, 8-spored, broadly clavate, broadly rounded above, saccate below and then suddenly constricted, almost sessile, or with a very short, thick knob-like foot, 46–60 \times 14–22 μ . Spores more or less distichous, cylindrical, clavate or somewhat fusiform, obtusely rounded at both ends, not attenuate above or very slightly so, tapering gradually and more definitely below, straight or slightly bent, 1-septate, not constricted, hyaline, with thick episporium, 17–23 \times 3.5–5 μ ; loculi equal or sub-equal. Paraphysoids rather numerous, indefinitely filamentous, erect, arising from the hyaline inner tissue of the perithecia, tardily becoming mucilaginous.

on dying apices of leaves of *Aloe lineata* Harv., Port Elizabeth, Doidge, 2293.

172. *Baumiella caespitosa* P. Henn.

in Bot. Ergebnisse der Kunene-Sambesi Exped. (1903) 165; Syll. Fung. 17, p. 708;
v. Höhnelt, Fragmente zur Mykologie no. 618.

Syn. *Gibbera tinctoria* Mass., in Bull. Bot. Gard. Kew (1911) 226; Syll. Fung. 24, p. 923;
Eyles in Rhod. Agr. Jour. 23 (1926) 642; Hopkins in Trans. Rhod. Sc. Ass. 35
(1938) 101.

Stromata epiphyllous, erumpent, closely crowded and covering the greater part of the leaf surface; (in Henning's type the stromata are in scattered, orbicular groups and the individual stromata not so closely crowded), black, round to irregular in outline, up to 1 mm. diam., verrucose or pulvinate, usually rough externally with irregular projections. The hypostroma consists of a parenchymatous tissue of very thin-walled, hyaline or yellow cells, very variable in form and size, often 3–10 μ diam., rounded, angular, cylindrical or quite irregular, becoming almost hyaline and filamentous below, and becoming resolved into numerous hyphae which penetrate more deeply into the mesophyll of the leaf. After breaking out from the tissues of the host, the ground tissue of the stroma consists of thin-walled, translucent blackish-brown or greyish-brown, rounded or angular cells, mostly 10–15 μ diam.; below and at the sides, the cells are often orientated in more or less vertical rows. The stroma is homogeneous without a firm outer crust, the outer layers of cells being very irregular and loosely compacted; it is rather more compact and smaller celled in the somewhat convex processes over the ostioles of the perithecia.

Loculi monostichous, one or few in each stroma, globose to ovate, 120–160 μ diam., with very short truncate-conical ostioles, traversed by an indefinite pore; locular wall consisting of several layers of hyaline, much compressed cells, but not clearly defined. Asci briefly pedicellate, fusiform, straight or curved, 112.5–135 \times 30–42.5 μ ; sp. part 85–100 μ long, narrowed above into an apical beak traversed by a pore, apices of the asci converging towards the ostiole. Spores distichous or conglobate, hyaline, cylindrical, rarely sub-clavate, 1-septate, not constricted, rounded at both ends, mostly 40–42.5 \times 10–11.5 μ , rarely 35 or 47 μ long. Paraphysoids well developed, consisting of plates of cells almost entirely separating the asci.

on leaves of *Monotes glaber* Sprague, Salisbury, Eyles 1967, 14006.

Apart from the grouping of the stromata, the greatest difference between the fungus examined and the type, lies in the size of the spores. Hennings states that they are 26–33 \times 9–13 μ ; Sydow in his study of a portion of the type specimen found this length to be correct, they were not longer than 35 μ , but they were a little narrower. Von Höhnelt, however, (loc. cit.) after re-examining the type gives the following spore measurements:—24–42 \times 7–9.5 μ ; it is possible that he examined a more mature piece of the material, and that the specimen described above is still better developed. Both Hennings and Von Höhnelt speak of 1- or 3-septate spores; 3-septate spores were not observed by Sydow in the type material nor in the specimen collected by Eyles. The latter must be regarded as a form of *Baumiella caespitosa* Henn. until further collections can be examined. The type was collected by Baum on leaves of *Monotes dasycantha* Gilg. near Quiriri, South West Africa (Baum 727, 1900).

Judging by the description, *Gibbera tinctoria* Mass. on *Monotes glaber* from Rhodesia, differs widely from *Baumiella caespitosa*; a portion of the type specimen was examined by Sydow, and he found this fungus identical with the *Baumiella* in habit and structure of the stroma. Unfortunately no ascospores could be found, but he is convinced that the two fungi are identical. The type of *Gibbera tinctoria* Mass. was collected on leaves of *Monotes glaber* at Hunyani, S. Rhodesia by Allen. (Rhod. Agric. Dept. Herb. 737).

173. *Venturia Cephalariae* Kalch. et Cke.

South African Fungi in Grevillea IX (1880) p. 31, tab. 137, fig. 36; Sacc. Syll. Fung. I (1882) p. 593.

Leaf spots scattered, round or somewhat irregular in outline, light brown with a purple margin, up to 4 mm. diam. Perithecia epiphyllous, in groups; at first veiled by the cuticle

in which is developed a thin plate of fungous tissue, composed of pale fuscous to dark brown, tortuous, branching and anastomosing hyphae ca. $5\ \mu$ thick, and extending towards the edge of the leaf spot. Perithecia in small or larger groups, globose, $100\text{--}125\ \mu$ diam., or if crowded, ovate to ellipsoid through mutual pressure and sometimes $60\text{--}75\ \mu$ diam., but uniformly ca. $125\ \mu$ high; ostiole erumpent, flat or broadly conical, traversed by a pore $15\text{--}20\ \mu$ broad, crowned with 6 to 12 or more numerous setae; setae erect, rigid, straight or slightly and irregularly curved, not septate, $25\text{--}42\cdot5\ \mu$ long, blackish-brown, sub-opaque, $5\text{--}7\ \mu$ thick at the base and tapering upwards to the paler, pellucid, rounded or sub-acute apex. Perithecial wall membranous, below composed of yellow brown, thin-walled, round to oval, somewhat angular cells $5\text{--}7\ \mu$ diam.; cells smaller, $5\text{--}7\ \mu$ diam. and darker brown above, where the wall is continuous with the hyphal plate in the cuticle. Asci numerous, 8-spored, clavate or clavate-ellipsoid, straight or slightly curved, often narrowing slightly towards the rounded apex, tapering gradually downwards, sessile or sub-sessile, $55\text{--}60 \times 11\text{--}12\cdot5\ \mu$; with a firm wall, ca. $1\cdot5\ \mu$ thick, not thickened at the apex when mature. Spores distichous, clavate, very unequally 1-septate, pale fuscous, broadly rounded above, tapering to the base, not constricted at the septum, $20\text{--}23 \times 9\text{--}10\ \mu$; lower cell only $6\text{--}6\cdot5\ \mu$ long, conical.

on leaves of *Cephalaria attenuata* (L.f.) R. et Sch., Somerset East, *Macdonan* 1338, 20813.

174. *Phaeosphaerella congregata* (Syd.) Doidge n. comb.

Syn. *Parodiella congregata* Syd., Ann. Myc. 10 (1912) p. 37.

Perithecia epiphyllous, minute, black shining, developing in close, round to irregular groups $1\text{--}5\ \text{mm.}$ diam.; leaf tissues not discoloured; immersed, sub-cuticular, more or less closely crowded, globose, $60\text{--}100\ \mu$ diam. Perithecial wall membranous, at first olivaceous tinged with dull bluish-green at the apex, then becoming yellowish-brown at the base, darker brown and sub-opaque at the apex; at the base formed of several layers of more or less angular, thin-walled cells, $7\text{--}8\ \mu$ diam.; more closely parenchymatous at the apex, composed of cells $3\text{--}6\ \mu$ diam.; traversed by a round pore $15\text{--}20\ \mu$ diam. Asci few, (2-7) in each perithecium, 8-spored, apophysate, sessile or sub-sessile, very variable in form and size; sometimes ovate or sub-globose, $30\text{--}40 \times 20\text{--}30\ \mu$, sometimes elongated, saccate, $50\text{--}65 \times 15\text{--}20\ \mu$; with a firm wall ca. $1\ \mu$ thick, more or less thickened at the apex. Spores distichous to tristichous, ellipsoid-oblong to sub-clavate, $26\text{--}30 \times 6\text{--}7\cdot5\ \mu$, rounded at both ends or occasionally sub-truncate below, constricted at the septum; at first sub-hyaline, then dark (olive-grey to iron grey, Ridgway); cells sub-equal or the upper slightly shorter and broader.

on leaves of *Limnanthemum thunbergianum* Griseb., Belfast, *Doidge*, 765.

In the revision of the genus *Parodiella* by Theissen and Sydow (Ann. Myc. 15, 1917, p. 112) this species is excluded, and it is suggested that it probably belongs to the genus *Phaeosphaerella*.

175. *Cryptodidymosphaeria clandestina* Syd.

in Ann. Myc. 37 (1939) 192-196.

Syn. *Phaeodothis Tristachyae* Syd. in Ann. Myc. 10 (1912) 4; Doidge in Bothalia 1 (1922) 67.

Perithecia parasitic in the stromata of Phyllachoraceae, entirely filling the cavities of the perithecia of the host, and conforming with them in shape and size, flattened-globose or somewhat irregular, $150\text{--}250\ \mu$ diam.; ostiole papilliform, usually fused with the ostiole of the host fungus, rarely erumpent through a small longitudinal crack, traversed by a round, poorly defined pore about $15\ \mu$ diam. Wall membranous, almost fleshy, $6\text{--}10\ \mu$ thick, composed of 2-3 layers of round or irregularly angular cells; at the sides these are somewhat elongated and arranged in more or less vertical, ascending rows; cells rather thick-walled, light yellow brown or honey yellow, often somewhat darker near the apex of the perithecium, $3\text{--}5\ \mu$ diam.; the outer surface of the perithecial wall is fused and merged with that of the

host and is thus not sharply defined. When the *Phyllachora* is attacked at an early stage of its development, its perithecia are not formed and then the perithecia of the parasite develop in the mesophyll of the leaves, under the phyllachoroid clypeus. Asci rather numerous, 8-spored, clavate, broadly rounded above, tapering gradually downwards, sessile or with a rather thick, knob-like foot, wall rather thick, slightly but definitely thickened round the apex, p. sp. $60-70 \times 8-10 \mu$. Spores more or less distichous, fusiform or biconical, tapering slightly to both obtusely rounded ends, but often somewhat more definitely towards the lower end, straight or somewhat asymmetrical, seldom slightly curved, 1-septate at or near the middle, not constricted or slightly so, rather dark grey-brown or olive brown, $11-17 + 4-5 \mu$. Paraphyses typical, filiform, simple or somewhat branched, about $1-1.5 \mu$ thick, only tardily becoming mucilaginous.

Pycnidia similar to the perithecia in growth and development, but often somewhat smaller and not completely filling the cavity of the host perithecium, fusing above with the inner wall of the latter, but not always reaching to the base, so that a small, irregularly crescent-shaped space is left between the pycnidial wall and the wall of the host perithecium; this space is filled with yellow brown vestiges of the fruiting layer of the host, permeated by the subhyaline, indistinctly septate, loosely branched hyphae of the parasite. Pycnidial wall finely and often very delicately membranous, $6-8 \mu$ thick, consisting of 2-3 layers of cells; cells very pale yellow or yellow brown, $3-5 \mu$ diam., round or somewhat elongated. Conidia massive, ellipsoid or ovate, broadly rounded at both ends, straight, rarely somewhat asymmetrical or very slightly curved, 1-celled, very pale greyish brown, $6.5-9.5 \times 3-4.5 \mu$, borne on somewhat conical or papilla-like conidiophores over the whole inner surface of the pycnidial cavity.

on *Phyllachora Tricholaenae* P. Henn., on *Rhynchelytrum repens* (Willd.) Hubb., Donkerpoort, Pretoria distr., Doidge and Bottomley, 29738.

on *Phyllachora Doidgeae* Syd., on *Cymbopogon marginatus* (Steud.) Stapf, Donkerpoort, Doidge and Bottomley, 29744, 29800.

on *Phyllachora Cynodontis* (Sacc.) Niessl., on *Cynodon Dactylon* L., Donkerpoort, Doidge and Bottomley, 29749.

on *Phyllachora* spp. on *Tristachya leucothrix*, Trin., (Type of *Phaeodothis Tristachyae* Syd.) Mooi River, Natal, Burt Davy, 1470; and on *Eragrostis* sp., Donkerpoort, Doidge and Bottomley, 29746.

Sydow took as his type a collection on *Phyllachora afra* Syd. on the leaves of *Sporobolus pyramidalis*, made by Deighton in Sierra Leone. He states that probably other *Phaeodothis* spp. on grasses, particularly the South African species *Ph. Tristachyae* Syd. will prove to be only *Phyllachora* plus *Cryptodimosphaeria*, and that this must be decided by an examination of good material. The size of the spores of *Ph. Tristachyae* in the original description is given as $12-13.5 \times 3-4 \mu$; a careful examination of the type collection indicates that spores up to $15 \times 5 \mu$ are not infrequent, and I can find nothing to differentiate this species from *Cryptodidymosphaeria clandestina*.

The conidial stage appears to be identical with *Coniothyrium occultum* Syd. (Ann. Myc. 35 (1937), 281, and loc. cit.).

176. *Dimerosporiopsis Engleriana* P. Henn.

in Hedwigia XL (1901) p. (173); Syll. Fung. XVII (1905) 681; Sydow in Ann. Myc. XVIII (1920) pp. 181-182.

Syn. *Dimerosporium Englerianum* P. Henn. in Pilz. Ostaf. (1931) p. 31.

Dimerium Englerianum Sacc. et D. Sacc. in Syll. Fung. XVII p. 537.

Aloysiella ruwenzorensis Mattir. et Sacc. in Annali di Botanici VII (1908) p. 143.

Othia deformans Pat. in Bull. Soc. Myc. France XXXIV (1918) p. 19.

Gibbera Engleriana (P. Henn.) van der Byl in South Afr. Journ. Sci. 25 (1928) p. 182.

?*Antennularia* (Coleroa) *Engleriana* (P. Henn.) v. Hohn., Fragm. Myk. XI (1909) 5.

Fungus caulicolous, causing some thickening and distortion of the affected parts, and covering them with a dark brown to black mycelial growth, which is often continuous for several centimetres. Mycelium extending through the cortex, and producing in the tissues of the host numerous small cushions, cellular in structure and irregular in form and size; these are brown, and formed of cells which may be irregularly polygonal and $5-10\ \mu$ diam., or, especially towards the periphery, with a tendency to become cubical and to develop in rows at right angles to the surface of the stem. At the surface, these cushions give rise to tufts of erect hyphae, which become so numerous as to completely clothe the stem with a turf-like growth. Erect hyphae brown, thick-walled, $5-6\ \mu$ thick, up to $400\ \mu$, high, septate; cells $20-25\ \mu$ long; sparingly branched and often tortuous and tangled. Perithecia numerous, nestling amongst the erect hyphae and attached to them at the base, globose or somewhat flattened, not setose, $220-350\ \mu$ diam., $250-300\ \mu$ high, collapsing and becoming cupulate when dry. Perithecial wall rough externally, grossly verrucose; olivaceous, composed of several layers of irregularly polygonal cells $10-15\ \mu$ diam.; without true ostiole, but with a thin place at the apex which breaks down and forms an irregular pore. Asci 8-spored, paraphysate, cylindrical, rounded above, up to $100\ \mu$ long; sporiferous part $75-80 \times 10-12.5\ \mu$; sterile portion below tapering to a well-defined foot. Paraphyses not numerous, hyaline, filiform. Spores distichous, 1-septate, pale olivaceous, clavate-ellipsoid rounded at ends, very slightly constricted at the septum, pluriguttulate, $16-19 \times 6-7\ \mu$. The spores examined from these South African collections were barely mature; the dimensions of the spores are given elsewhere as $18-25 \times 7-10\ \mu$.

on *Erica cristaeiflora* Salisb., on stems Tulbagh, *Dippenaar* (van der Byl, loc. cit.).

Erica imbricata L., Klapmuts, *Acock*, 27668.

Erica leucopelta Tausch., bush behind village, Knysna, *Bottomley*, 30729.

Erica pellata Andr., Knysna, *Bottomley*, 30730.

Erica spp., Cape, MacOwan; Hermanus, *Pole Evans*, 27697, 27704; Tulbagh, *Dippenaar* (v. d. Byl).

Scyphogene inconspicua Brogn., Hermanus, *Pole Evans*, 27703, *Louwrens*, 30731.

This fungus was first described by Hennings on *Ericinella Manii* collected by Volken in tropical Africa, and it appears to be a very common parasite on various genera of the Ericaceae in tropical Africa. Its nomenclature has been discussed by Sydow (loc. cit.) and der Byl (l.c.); the latter author puts it into the genus *Gibbera*. Dr. Sydow states (in litt.) that "It is difficult at present to say to what genus it should be assigned, as the genera *Coleroa*, *Antennularia*, *Gibbera*, *Othia* and similar ones need revision. I think, however, that the fungus can hardly be called a *Coleroa* or *Antennularia*. Its relationship is rather with *Gibbera* and *Othia*. The fungus has twice been put into a separate genus, namely *Dimerosporiopsis* (1901) and *Aloysiella* (1908). It might well prove that the fungus really represents a distinct genus. Therefore I would propose to name it for the present *Dimerosporiopsis Engleriana* Henn."

177. *Pseudothyridaria moroides* Syd.

in Ann. Myc. 37 (1939) 182-184.

Stromata solitary, distant, gall-like, carinate, parallel with the axis of the stem, from which they become erumpent through longitudinal cracks; on the smaller twigs these are up to 13 mm. long, about 4 mm. broad and up to 2 mm. high; on larger stems they may be up to 3.5 cm. long, 7.5 mm. broad and 4 mm. high; on old branches lesions have been seen up to 7 cm. long and 5 mm. broad, but in these the stromata are old and brittle or broken down. The hypostroma which seems to originate between the wood and the cortex, either consists of a parenchymatous tissue of very thin-walled, hyaline or sub-hyaline, rounded-angular cells, $4-10\ \mu$ diam., which includes discoloured and collapsed remnants of the substratum, or takes the form of erect plates, $150-200\ \mu$ thick, orientated in the direction of the longitudinal axis of the host, tapering inwards and pressing like wedges between the

cells of the host. After breaking out from the host tissues, the stroma spreads on both sides of its longitudinal axis, forming irregular stromatal cushions, with a definite fissure or fold in the centre which remains sterile; the folded and wrinkled stromatic surface is dull grey or brownish black, in the fertile parts closely verrucose throughout the formation of convex processes over the ostioles of the perithecia. Ground tissue of the stroma parenchymatous, pale grey or greyish brown within, and composed of round or irregularly angular, or elongated cells $5-12\ \mu$ diam.; at the surface there is an apical crust, $90-140\ \mu$ thick, composed of greyish-black, thick-walled opaque cells arranged in more or less definite vertical rows.

Perithecia monostichous, completely and often deeply immersed, in the stroma, globose or globose-ovate, often somewhat flattened and irregular through mutual pressure, $200-400\ \mu$ diam., rarely larger. Ostioles cylindrical, completely innate in the stroma, punctiform-erumpent, not emerging or barely so, truncate, not grooved, traversed by a pore $30-40\ \mu$ broad. Perithecial wall membranous, often definitely recognisable only at the base and the sides, $15-20\ \mu$ thick, consisting of several layers of much-compressed subhyaline cells. Asci numerous, 8-spored, cylindrical-clavate, broadly rounded above, tapering slightly but decidedly downwards into a short stalk, thin-walled, p. sp. $100-130 \times 6-8\ \mu$. Spores obliquely monostichous or incompletely distichous, fusiform, tapering more or less to the obtusely rounded ends, straight or slightly bent, 3-septate, less frequently 1-2-septate, not constricted, or very slightly constricted in the middle, light yellow brown or honey yellow, $16-30 \times 4-6\ \mu$. Paraphyses very numerous, rather coarsely filamentous, usually simple $1.5-2.5\ \mu$ thick, exceeding the asci.

on stems of *Rubus pinnatus* Willd., Xumeni Forest, near Donnybrook, Natal, *Morgan* and *Doidge*, 30374.

178. *Ceratosphaeria crinigera* (Cke.) Sacc.

Syll. Fung. II (1883) p. 227.

Syn. *Sphaeria* (*Ceratostoma*) *crinigera* Cke. in *Grevillea* I (1873) p. 156.

Perithecia innate, becoming erumpent and finally superficial, scattered or in small groups, surrounded at the base by brown hyphae, which are long, flexuous, septate, $2-3\ \mu$ thick; perithecia flask-shaped, rugulose, densely clothed—except in the upper part of the neck—with dark brown, simple, flexuous, septate setae, which are of varying length and obtuse at the apex; basal part of perithecia sub-globose to ovate, $300-450\ \mu$ diam.; neck $250-400\ \mu$ long, $150-180\ \mu$ thick, traversed by a pore which is up to $90\ \mu$ broad and closely lined with fine, hyaline periphyses. Wall of perithecium dark brown to black, $60-75\ \mu$ thick, composed of numerous layers of flattened cells; inner layers brown, thin-walled and up to $12.5\ \mu$ diam., outer layers black, opaque, and structure not easily seen. Asci very numerous, 8-spored, cylindrical-clavate, rounded above, tapering towards the base, sessile, $70-75 \times 7.5-9\ \mu$. Paraphyses hyaline, filiform, disappearing early. Spores obliquely monostichous, hyaline, cylindrical to ellipsoid, broadly rounded at the ends, 3-septate, not constricted at the septa, $9-11.5 \times 3.75-4\ \mu$.

on rotting wood, Xumeni Forest, near Donnybrook, Natal, *Morgan* and *Doidge*, 30368.

On comparison the South African fungus is not found to differ from European specimens of this species. It was first described on pine wood in Great Britain, and its occurrence in South Africa is of interest.

179. *Eudarlucula australis* Speg.

in *Revista del Museo de la Plata* XV (1908) 22; Syd. in *Ann. Myc.* 24 (1926) 360-362.

Syn. *Myrmaecium cannae* Dearn. et Barth. in *Mycologia* 9 (1917) 347; Syll. Fung. 24, p. 759; Petrak in *Ann. Myc.* 25 (1927) 301.

Stromata developing in the uredo-sori of rust fungi; basal stroma growing into the mesophyll of the leaf, erumpent, more or less parenchymatous, consisting of light-coloured,

thin-walled cells, which, immediately under the loculi, are often in vertical rows. Loculi single more or less central, often completely immersed; or 2-3, of which 1 or 2 are lateral and project from the stromata; stroma often numerous and crowded, so that a large number of loculi are observed in close proximity. Loculi broadly ovate or ellipsoid, about $100-160\mu$ diam., quite closed without a trace of an ostiole, or, less frequently, very obtusely and broadly conical at the apex, which is traversed by a pore; the pore is irregularly round to angular. Walls of the loculi $15-25\mu$ thick, formed of several layers of round to angular, rather thin-walled cells; outer layers translucent, dark brown, $7-12\mu$, or rarely up to 15μ diam. not compressed or only slightly so; inner layers much compressed and usually hyaline. Asci rather numerous, 8-spored, cylindrical-clavate or cylindrical, broadly rounded above, tapering somewhat towards the base, quite sessile or with a short thick foot, thick-walled, not thickened at the apex or very slightly so, sporiferous part $65-80 \times 7.5-10\mu$. Spores obliquely monostichous or incompletely distichous, fusiform, tapering to both bluntly rounded ends, straight, rarely slightly bent, usually with three cross walls of which only the central one is readily distinguishable, not constricted, or slightly constricted at the central septum, hyaline, $14-21\mu$ (mostly about 17μ) long and $3.5-5\mu$ (usually 4μ) broad. Paraphysoids very sparse. Conidial loculi (*Darluca*) smaller than the ascigerous loculi, are usually to be found in an empty or over-ripe condition on the edges of the stroma.

in uredo-sori of *Puccinia Eragrostidis-superbae* on leaves of *Eragrostis happula* Nees var. *divaricata*, Derdepoort, Pretoria Distr., Doidge and Bottomley, 29813, and on *Eragrostis superba*, without locality, 14124.

on *Uredo* undet. on leaves of *Eragrostis* sp., Irene, Pretoria Distr., S. Smuts, 17014.

In the first two numbers quoted, the uredo-spores and paraphyses of the *Puccinia* can be found beyond the edges of the stroma; traces of a rust have also been found in 17014.

It was suggested by Spegazzini (loc. cit.) that this is the ascus stage of *Darluca filum*, and in specimens collected at Costa Rica, Sydow actually found the conidial form in the same uredo-sori as the ascus stage. Petrak (l.c.) also found the conidia associated with the ascus stage of *Myrmaecium Cannae* Dearn. et Barth. in the uredo-sori of *Puccinia Cannae*, and states that the latter fungus is identical with *Eudarluca*. The South African fungus is not very well developed, but is definitely identical with the fungus described from the American collections; the *Darluca* stage has been detected associated with the *Eudarluca* in these collections also.

180. *Lasiosphaeria hispida* (Tode) Fuck.

Symb. myc. (1869) p. 147; Syll. Fung. II, p. 194; Seaver in Mycologia IV (1912) p. 119.

Syn. *Lasiosphaeria capensis* Kalch et Cke. in Grevillea 9 (1880) p. 28, Syll. Fung. II, p. 195.

Perithecia more or less closely gregarious, surrounded by a web of black mycelium; the mycelium consists of dark brown to blackish brown hyphae, rather remotely septate, sparsely branched, $5-6\mu$ thick. Perithecia ovoid to pyriform, $300-500\mu$ diam., $450-600\mu$ high; outer wall rough and clothed with numerous, dark brown, remotely septate hairs, which are very long and flexuous near the base, shorter, straighter and more rigid towards the apex; the latter are $50-100\mu$ long, $6-7.5\mu$ thick at the base, and tapering somewhat to a blunt apex. Perithecial wall irregular in thickness; inner part dark brown, consisting of several layers of very much flattened cells; outside this is an irregular layer of rather loosely compacted pseudoparenchyma. Asci cylindrical-clavate, 8-spored, rounded above, tapering somewhat to the base and briefly pedicellate, $160-180 \times 12-18\mu$. Spores distichous, twisted, subclavate or cylindrical, rounded at both ends, often bent near one end, 7-septate, at first hyaline, then pale fuscous, $50-80 \times 6-8\mu$.

on bark, Somerset East, Cape. MacOwan 1397, 20817.

There is only a small part of the original collection in the Cryptogrammic Herbarium; no further collections have been made. There appears to be no difference between this fungus and *Lasiosphaeria hispida* as defined by Seaver; for Seaver's list of synonyms see Mycologia (loc. cit.)

181. *Leptosphaeria Sacchari* van Breda.

Meded. v. Proefstat. v. Suikerr. in West Java (1892) p. 25; Butler, Fungi and Disease in Plants (1918), p. 381; van der Byl, Union Dept. Agric. Sc. Bull. 10 (1918) p. 15.

Perithecia developing in leaf spots, which are often numerous on a single leaf, scattered, more or less elliptic in outline, visible on both surfaces of the leaf, up to 15 mm. long and 5 mm. broad, dry, straw-coloured in the centre and sharply defined by a narrow, reddish purple or brownish margin; this ring is not usually regular, but lobed, or broken by angular projections; neighbouring leaf spots often become confluent, and form larger irregular blotches. The discoloured leaf tissues are permeated by fine, hyaline hyphae about $1\ \mu$ thick. Perithecia numerous, epiphyllous, rarely hypophyllous, arranged in rows between the finer veins of the leaf, remote from one another or more closely placed, but not crowded, immersed in the mesophyll, globose or sub-globose, $100\text{--}155\ \mu$ diam., narrowed above into an apical papilla; papilla up to $75\ \mu$ long, erumpent, protruding slightly from the epidermis, traversed by a rather indefinite pore. Perithecial wall pale to darker yellowish brown, translucent, composed of rather thin-walled, angular, slightly compressed cells $5\text{--}10\ \mu$ diam. Asci fairly numerous, 8-spored, cylindrical to clavate, straight or curved, rounded above, briefly pedicellate with a short, knob-like foot, $70\text{--}80 \times 12\text{--}12.5\ \mu$; wall firm, slightly thickened at the apex. Spores distichous, 3-septate, fusoid to sub-clavate, tapering to rounded ends, constricted at the septa, at first hyaline, then fuscous, $20\text{--}25 \times 5\ \mu$. Paraphyses fairly numerous, hyaline, filamentous, ca. $1\ \mu$ thick, exceeding the asci.

on leaves of *Saccharum officinarum* L., Natal Sugar Estates, *McMartin*, 31040, 31041.

The so-called "ring spot" of sugar cane, caused by *Leptosphaeria Sacchari*, was first described in Java, and occurs in many countries where sugar cane is cultivated. It was recorded by van der Byl (loc. cit.) from Natal and Zululand in 1918.

182. *Sporormia transvaalensis* Doidge nov. sp.

Perithecia sparsa v. gregaria, immersa, deinde erumpentia et in maturitate partim denudata, globosa v. ovoidea, $450\text{--}500\ \mu$ diam., $500\text{--}700\ \mu$ alta, rugulosa, coriacea, opace nigra, pariete ca. $60\ \mu$ crasso, ostiolo conico-truncato v. sub-cylindraceo, usque $200\ \mu$ longa; asci cylindraceo-ellipsoidei, 8-sporei, apice rotundati, breve stipitati, $95\text{--}110 \times 17.5\text{--}20\ \mu$, crasse tunicati; sporae distichae, cylindraceae, 3-septatae, opace brunneae, profunde constrictae, facile secedentes, $40\text{--}45 \times 6\text{--}7\ \mu$, articulis subaequalibus, strato gelatinoso angusto obvolutae.

Hab. in fimo bovino, Kromrivier, leg. *Doidge*, 30235.

Perithecia scattered or in groups, immersed, later becoming more or less erumpent and often partly exposed at maturity, globose-ovoid, $450\text{--}500\ \mu$ diam., $500\text{--}700\ \mu$ high, opaque black, coriaceous, wall about $60\ \mu$ thick, outer layers opaque, tuberculate on the surface, inner layers dark brown to fuscous, composed of somewhat flattened, thin-walled cells; ostiole a truncated cone or sub-cylindrical, up to $200\ \mu$ long. Asci cylindrical to ellipsoid, 8-spored, rounded at the apex, briefly stipitate, $95\text{--}110 \times 17.5\text{--}20\ \mu$, thick-walled, wall $1.5\text{--}2.5\ \mu$ thick. Paraphyses not seen (material rather old). Spores distichous, cylindrical, 3-septate, dark brown, opaque, deeply constricted and readily separating at the septa, surrounded by a thin mucous layer, $40\text{--}50 \times 6\text{--}7\ \mu$; segments sub-equal, medial segments cylindrical, terminal segments subcylindrical, tapering very slightly to broadly rounded ends.

on cow dung, Kromrivier, Rustenburg District, Transvaal, *Doidge*, 30235.

Gibbs, in the Journal of the Linnean Society 38 (1909) p. 416, mentions three species of *Sporormia* collected by Cheesman in the Matopopo Hills. One of these, *Sporormia pascua* Niessl has 7-septate spores, *Sp. Ambigua* Niessl and *Sp. intermedia* Auerw. have 3-septate spores, but differ from the fungus described above in the size of the perithecia, asci and spores. There appear to be no other records of fungi of this genus occurring in South Africa.

183. *Rhynchosphaeria Fagarae* Doidge nov. sp.

Perithecia sparsa v. pauca sub-aggregata, immersa, globosa, coriaceo-carbonacea, ostiola cylindracea usque $200\ \mu$ longa pertusa, $200\text{--}220\ \mu$ diam. Asci numerosi, clavati, apice rotundati, basim versus attenuati, breviter pedicellati, 8-sporei, $45\text{--}60 \times 6\text{--}7.5\ \mu$. Sporae distichae, clavatae, plus minus curvatae v. rectae, utrinque obtusae, 3-septatae, ad septa, praecipue medium, constrictae, ex hyalino brunneolae, $11\text{--}12.5 \times 3.5\text{--}3.75\ \mu$.

Hab. in cortice *Fagariae capensis* Thunb., Boschfontein, Pretoria distr., leg. Doidge et Bottomley, 31067.

Perithecia scattered or in small groups, immersed in the cortex, seated at the base on the wood, sub-carbonaceous, globose, narrowed above into cylindrical ostioles, which protrude somewhat from the periderm, $200\text{--}220\ \mu$, diam. Ostioles cylindrical, up to $200\ \mu$ long straight or curved, ca. $60\text{--}80\ \mu$ thick, often dilated somewhat near the entire apex; traversed by a pore lined with numerous fine, hyaline periphyses. Perithecial wall firm, $15\text{--}25\ \mu$ thick, blackish brown, outer layers opaque, inner more or less translucent, mostly $5\text{--}10\ \mu$ diam.; giving place within to a hyaline, filamentous layer. Outwardly the wall is connected with a tangle of loosely interwoven, fuscous hyphae, $2\text{--}2.5\ \mu$ thick, permeating the cortical tissues which are more or less broken down. Asci very numerous, lining about seven-eighths of the perithecial cavity, 8-spored, clavate, straight or slightly curved, rounded above, tapering at the base to a short stalk, $45\text{--}60 \times 6\text{--}7.5\ \mu$; wall very firm, not staining blue with iodine. Paraphyses very numerous, hyaline, slender, filiform, barely $1\ \mu$ thick, exceeding the asci. Spores distichous, clavate, 3-septate, hyaline then light brown, tapering to blunt ends, slightly constricted, sometimes more deeply at the central septum, $11\text{--}12.5 \times 3.5\text{--}3.75\ \mu$; the second cell from the upper end is the broadest.

on branches of *Fagaria capensis* Thunb., Boschfontein, near Wolhuter's Kop, Pretoria distr., Doidge and Bottomley, 31067.

184. *Pseudovalsa longipes* (Tul.) Sacc.

in Syll. Fung. 2 (1883) p. 136; Winter in Rabh. Kryptog. Flora von Deutschland II, p. 787; Petrak in Ann. Myc. XXI (1923) pp. 323-324.

Syn. *Melanconis longipes* Tul. Carp. II, p. 139.

Calospora longipes (Tul.) Berlese in Icones fung. I (1894) p. 117 tab. CXXII fig. i.

Coryneum Kunzei Corda Ic. Fung. IV, p. 46; Syll. Fung. III, p. 778.

Stromata corticolous, seated on the wood, scattered, discrete, black, irregularly round to elliptic, $1\text{--}2.5\ \text{mm. diam.}$, rather smooth above, surrounded and partially veiled by the ruptured cortex. *Perithecia* 4-12 in each stroma, globose or flattened by mutual pressure, $270\text{--}400\ \mu$ diam., $300\text{--}350\ \mu$ high; ostioles convergent, oblique and curved on marginal *perithecia*, $250\text{--}450\ \mu$ long, not prominent. Asci paraphysate, 8-spored, cylindrical-clavate, rounded at the apex, briefly pedicellate, $110\text{--}155 \times 20\text{--}22.5\ \mu$; wall about $1.5\ \mu$ thick thickened at the apex to $5\text{--}6\ \mu$. Spores distichous or irregular, fusiform-clavate, hyaline, mostly 3-septate, less frequently 2- or 4-5-septate, tapering at both ends, terminal cells conical, not constricted, separating rather readily at the septa, $50\text{--}70 \times 7.5\text{--}9\ \mu$. The spores are barely mature in these *perithecia*; according to Winter the mature spores are brown.

Conidial stage is a *Coryneum*; acervulae scattered or more or less crowded, sometimes on the same twigs as the ascigerous stromata, black, disciform, erumpent, surrounded by the ruptured outer bark, $1\text{--}1.5\ \mu$ diam., $350\text{--}450\ \mu$ high; base composed of a loose web of brown, thin-walled hyphae, which become erect near the surface and give rise to numerous conidiophores. Conidiophores pale olivaceous to almost hyaline, more or less flexuous, up to $150\ \mu$ long, about $5\ \mu$ thick at the base and tapering upwards to $2.5\text{--}4\ \mu$. Conidia olivaceous brown, 4-7-septate, frequently 5-septate, clavate, more or less curved, rarely straight, curvature usually more acute near the upper end, tapering somewhat to the apex which is paler, often sub-oblique, rounded, tapering gradually downwards into the conidiophore, $40\text{--}75 \times 12\text{--}14\ \mu$.

on branches of *Quercus* sp., Wellington, *Doidge*, 2163.

The conidial stage has been collected several times on branches of *Quercus* sp., Wellington, *Doidge*, 987, 2161, 2162.

The ascospores are barely mature; Winter states that the mature spores are brown, in which case the fungus belongs to the genus *Pseudovalsa*, and not to *Calospora* as stated by Berlese who saw only hyaline spores. Petrak is also of the opinion that this species is a genuine *Pseudovalsa*. On comparison with European specimens, it was found that the South African fungus was identical with *Pseudovalsa longipes*. The species is rare in Europe.

According to Saccardo, the conidial stage is *Coryneum Kunzei*, Cda.

185. *Pleospora Doidgeae* Petr.

in Ann. Myc. 25 (1927) 293-295.

Syn. *Dictyochorella andropogonis* Doidge in Bothalia I (1922) p. 66.

Perithecia formed in a phyllachoroid stroma, usually scattered, less frequently close together and then arranged in longitudinal rows, flattened globose or ellipsoid, very variable in size, 150-320 μ diam. and 100-200 μ high; ostiole erumpent on the upper or lower leaf surface, conical truncate, opening by a round pore. Perithecial wall membranous, usually about 8-10 μ thick, composed of a few layers of rather closely compressed cells; the cells are irregular or polygonal, thin-walled, about 5-8 μ , rarely up to 10 μ diam., they are pale, translucent, yellow-brown or clove brown, but always darker coloured near the apex. It sometimes happens that single perithecia occur outside the phyllachoroid stroma, but near its edge; such perithecia have usually a stronger wall, up to 25 μ thick. Asci clavate or clavate-cylindrical, broadly rounded at the apex, more or less tapering below, sessile or with a short, thick foot, becoming greatly distended as they begin to mature, with a firm, thick wall, 8-spored, about 60-80 μ long, later up to 100 μ long, 12-15 μ broad. Spores ellipsoid or ellipsoid-fusiform, tapering considerably to the obtuse ends, straight or slightly curved, with three or very seldom four cross walls, decidedly and often deeply constricted at the centre, elsewhere not constricted at the septa or only very slightly so; the second cell from the apex often projects slightly, and is sometimes traversed by a longitudinal wall, which is often oblique and usually very inconspicuous. Spores comparatively light yellow-brown or olive-brown, 13-18 μ long, seldom up to 20 μ long, 6-7.5 μ broad. Paraphyses very numerous, coarsely filamentous, branched, 1-1.5 μ thick, coalescing above with the perithecial wall.

In a phyllachoroid stroma on leaves of *Cymbopogon validus* Stapf. (= *Andropogon nardus* L. var. *validus*), Tugela Valley near Mont-aux Sources, Natal, *Doidge*, 14104.

After making a detailed study of this fungus, Petrak came to the conclusion that it is not a Phyllachoraceae with muriform spores, but a typical *Pleospora* parasitic in the stroma of a *Phyllachora*. He considers it extremely unlikely that there is such a thing as a true phaeo-dictyosporous phyllachoroid fungus.

It seems likely that the stroma in which this fungus is parasitic is that of *Phyllachora Doidgeae* Syd., which it resembles, and which occurs commonly on leaves of *Andropogoneae*. As indicated in the original description (Bothalia loc. cit.) the fungus has a true *Hendersonia* pycnidial stage.

186. *Ophiobolus Stipae* Doidge nov. sp.

Perithecia sparsa vel laxe gregaria, subglobosa, atra, 250-350 μ diam., immersa; ostiolo truncato, conoideo, 85-90 μ alto et 125-135 μ lato, tandem erumpentia, glabra, pseudoparenchymatice contexta, obscure olivacea, cellulis parietis 12-15 μ diam.; asci fasciculati cylindraneo-clavati, 8-sporei, 100-150 \times 7-8 μ , breviter stipitati, ad apicem rotundati membrana in ascis junioribus ad apicem incrassata, usque ad 8 μ ; paraphyses copiosae,

hyalinae, circiter 1 μ crassae, filiformes, ascos quoad longitudinem aequantes vel superantes, sporae filiformes, fere ascorum longitudine, pluri-guttulatae, in massa flavo-brunneae; singulae subhyalinae, utrinque attenuatae, rectae vel flexuosae, $100-125 \times 2-2.5 \mu$.

Hab. in vaginis *Stipae dregeanae* Steud., in silvis prope Donnybrook, leg. *Morgan et Doidge*, 29829.

Perithecia scattered or loosely grouped, sub-globose, black, $250-350 \mu$ diam., immersed, at length erumpent; ostiole truncate, conoid, $85-90 \mu$ high and $125-235 \mu$ broad. Perithecia smooth, wall pseudoparenchymatous in structure, dark olivaceous, composed of cells $12-15 \mu$ diam. Asci fasciculate, cylindrical-clavate, 8-spored, $100-150 \times 7-8 \mu$, briefly stipitate, rounded at the apex; in the younger asci the wall is thickened at the apex, up to 8μ . Paraphyses copious, hyaline, about 1μ thick, filiform, equalling the asci in length or longer. Spores filiform, almost as long as the asci, pluriguttulate, yellow-brown in mass, singly sub-hyaline, tapering to both ends, straight or flexuous, $100-120 \times 2-2.5 \mu$.

on dying sheaths of *Stipa dregeana* Steud., Xumeni Forest near Donnybrook, Natal, *Morgan and Doidge*, 29829.

187. *Hysterostoma Acocantherae* (P. Henn.) Theiss. et Syd. in Ann. Myc. 13 (1915) pp. 238-239.

Syn. *Dimerosporium Acocantherae* P. Henn. in Engl. bot. Jahrb. XVII (1893) p. 4; Syll. Fung. XI, p. 259, on living leaves of *Acocanthera Schimperi* in Erythraea.

Stromata hypophyllous, circular in outline, dull black, 3-5 mm. diam., carbonaceous, rough in the centre and surrounded by a radiating fringe of hyphae. The hyphae are brown, irregular, septate, undulating and anastomosing, $4-5 \mu$ thick. The central part of the stroma consists of numerous, closely crowded loculi, which are round to elliptic, irregular, $150-250 \mu$ diam., or, if elliptic, up to 350μ long, $100-150 \mu$ high; outer covering rather thick, carbonaceous, breaking down irregularly at maturity. The hypostroma is epidermal, colourless, but produces in the air spaces under the stomata an opaque mass of dark brown plectenchyma, which grows through the stomata and produces the fruiting bodies, the hypothecium being thus in direct connection with the hypostroma at several points under each locus. Hypothecium olive brown, cellular, irregular in thickness. Asci broadly ellipsoid or ovate, paraphysate, 8-spored, $75-90 \times 35-40 \mu$, wall $2.5-3.5 \mu$ thick, thickened round the apex, up to 10μ . Paraphyses numerous, hyaline, filiform, $2-2.5 \mu$ thick, exceeding the asci. Spores usually distichous, brown, 2-celled, oblong or sub-clavate, rounded at both ends, more or less constricted at the septum, $30-33 \times 12.5-14 \mu$; upper cell slightly larger and more broadly rounded, $15-17.5 \times 12.5-14 \mu$, lower $12.5-16 \times 10-11.25 \mu$.

on leaves of *Acocanthera* sp., Schagen, Nelspruit distr., Transvaal, *Liebenberg* 29906.

This fungus agrees with the description of *Hysterostoma Acocantherae*, but it is stated (Ann. Myc. loc. cit.) that the type specimen is poorly developed. The South African material shows an older stage, and is better developed. The *Acocanthera* sp. on which it is found differs from the common South African species, and may be a variety of *A. Schimperi*.

188. *Aphysa senniana* (Sacc.) Doidge n. comb.

Syn. *Phaeosphaerella senniana* Sacc. in Ann. Myc. 8 (1910) 337; Doidge in Trans. Roy. Soc. S. Afr. 8 (1920) 118; Sydow in Ann. Myc. 24 (1926) 270-271.

Amphigenous, not producing true leaf spots but often causing an indefinite light brown discolouration. Fruiting bodies in groups, which are more or less sharply defined, irregular or angular, seldom more or less circular, about 1-3 mm. diam., often coalescent and thus producing larger, irregular aggregates; individual fruiting bodies in these groups remote from each other or fairly close together, subcuticular, circular, more or less angular or irregular in outline, $100-170 \mu$ in diam., and up to 50μ high. In the crowded groups, two or more individuals may be in close proximity to one another and the edges of the covering membranes fuse. Basal layer perfectly flat, growing out of the epidermis, about $5-7 \mu$ thick,

filamentous, composed of small cells, sub-hyaline or pale yellow brown. Covering membrane flattened-conical, opening in the centre, or often more or less excentrically, by a round or irregular pore about $25\ \mu$ diam. Covering membrane about $5\ \mu$ thick, composed of 1-2 layers of rounded polyhedral cells; at the margin these are thin-walled, pellucid olive brown and about $5-7.5\ \mu$ diam.; in the centre near the pore, they are smaller, rather thick-walled, about $3-5\ \mu$ diam., blackish-brown and almost completely opaque. The covering membrane is not sharply defined at the margin, where it unites at an acute angle with the basal layer, often extending somewhat beyond the edges of the latter. Asci clavate, occasionally slightly distended at the base, tapering slightly to the broadly rounded apex, sessile or with a short, thick, knob-like foot, 8-spored, thick-walled, $35-45 \times 10-12.5\ \mu$. Spores more or less distichous, oblong to sub-clavate, obtusely rounded at both ends, tapering somewhat to the lower end, straight or somewhat asymmetrical, rarely slightly bent, 1-septate, cells equal in length or upper slightly shorter, more or less constricted, pellucid, comparatively light olive brown, $10-13 \times 5-6\ \mu$. Paraphyses numerous, hyaline or subhyaline, forming indefinite erect masses between the asci, which converge towards the centre of the covering membrane.

on leaves of *Protea caffra* Meisn., Fairy Glen, Pretoria, Doidge, 23421; The Willows, Pretoria distr., van der Byl, 5590.

on *Protea lepidocarpodendron* Linn., Wellington, Cape, Doidge, 1034, 2062.

on *Protea acaulis* Thunb., Wellington, Doidge, 1022; Klappmuts, van der Byl, 6845.

on *Protea* sp., Mont-aux-Sources, Natal, Doidge, 23420.

Originally described by Saccardo (loc. cit.) on dying leaves of *Protea abyssinica* from Erythraea, this fungus occurs commonly on leaves of *Protea* spp. in South Africa.

The South African fungus was studied by Sydow (loc. cit.) who expressed the opinion that it was a *Stigmatella* sp., but reserved his final opinion until more mature specimens had been examined. Further material studied was in better condition, but after an examination of this no amendment seems necessary to the description given by Sydow, from which the above is adapted.

In a previous publication, one of the hosts mentioned for this fungus was *Protea melaleuca*; this plant is now regarded as a form of *Protea lepidocarpodendron*.

189. *Glioniella natalensis* Doidge n. nom.

Syn. *Glioniella multiseptata* Doidge (not Spegazzini) in Trans. Roy. Soc. S. Africa 8 (1920) p. 119.

on stems of *Euphorbia triangularis* Desf., Amanzimtoti, Doidge, 5624.

The name *Glioniella multiseptata* has been used by Spegazzini (Fungi nonnulli Paraguariae et Fuegiae in Rev. mycol. XI 1889, p. 93; Sacc. Syll. Fung. IX, 1891, p. 1113) for a fungus on *Pernetia mucronata* "in Burnt Island, Fuegia". A change of name is therefore necessary for the South African fungus.

190. *Pseudographis Chrysophylli* Doidge nov. sp.

Perithecia dispersa v. laxe aggregata, innato-erumpentia, demum sub-libera, primitus globosa v. ellipsoidea clausa, dein urceolata crasse marginata et discum labiis medio distantibus denudantia, disco pallido plerumque oblongo rarius orbiculare plano, margine irregulariter sub-crenulato, ruguloso cincta; postremo fere sessilia, atra, rugulosa, sub-nitida, usque $1.5\ \text{mm.}$ longa et $1\ \text{mm.}$ lata. Asci numerosi, plerumque 4-sporei, clavati, apice rotundati, basi, sensim attenuati, pedicellati, $175-200 \times 17.5-25\ \mu$, densissime paraphysati. Paraphyses filiformes, septatae, ca. $1.5\ \mu$ crassae, apice clavulatae, incrassatae usque $3-4\ \mu$. Sporae monostichae v. sub-distichae, transverse 7-septatae, rarissime 5-septatae, oblongae v. ellipsoideae, rectae v. curvatae, hyalinae, haud constrictae, crasse tunicatae, $35-50 \times 12-15\ \mu$.

Hab. in cortice *Chrysophylli magalismsontanæ* Sond., Boschfontein, Pretoria distr., leg Doidge et Bottomley, 31066.

Perithecia scattered or loosely grouped, developing under the periderm which soon becomes ruptured, becoming erumpent; at first flattened globose, closed, then urceolate with a thick margin, up to 1.5 mm. long and 1 mm. broad; the surface fissures longitudinally or more or less irregularly, exposing the disc which is oblong or irregularly circular, flat, pale yellowish to flesh colour; lips fairly distant, irregular, black, carbonaceous, rugulose, with numerous irregular cracks. The perithecium is attached by a broad foot, which penetrates the tissues of the host; the torn periderm is closely adherent to the sides of this basal portion. Inner part of perithecium sub-hyaline to pale yellowish brown, formed of closely interwoven hyphae; the ascus-bearing disc forms in this tissue, about half way between the foot and the outer crust, at first bowl-shaped, then more or less flat. Outer crust blackish brown, opaque, carbonaceous, irregular in thickness, 10–20 μ thick at the upper surface, where it fissures and falls away at maturity exposing the disc, 25–50 μ thick at the sides where the lips finally develop. Asci numerous, usually 4-spored, occasionally 2-spored, clavate, rounded at the apex, tapering gradually downwards to an irregular foot, 175–200 \times 17.5–25 μ ; wall ca. 1 μ thick, not thickened at the apex. Paraphyses very numerous, hyaline, simple, septate, flexuous, filamentous, ca. 1.5 μ thick; clavulate at the tip and thickened to 3.4 μ , exceeding the asci. Spores monostichous, the two upper spores oblique the two lower straight, or sub-distichous with the two upper spores parallel to one another; at first 1-septate, then 3-septate and finally 7-septate, rarely 5-septate, cylindrical, not tapering to the rounded ends or only slightly so, straight or curved, not constricted, very thick walled, 35–50 \times 12.5–15 μ ; wall 3.5–4.5 μ thick, cross walls 1.5–2 μ thick, lumen of cells ellipsoid to conical. The terminal cells occasionally develop germ tubes while still in the perithecium.

on bark of *Chrysophyllum magalismsontanum* Sond., Boschfontein, near Wolhuter's Kop, Pretoria distr., Doidge and Bottomley, 31066.

191. ***Tribliidiella rufula*** (Sprengl.) Sacc.

Syll. Fung. II (1883) p. 757; Kalch. and Cke., Grevillea IX (1880) p. 26; Kalch., Grevillea X (1882) p. 145; Wakefield, Kong. Norske Vidensk. Selsk. Forhandl. 9, (1936) p. 53.

Perithecia scattered or in groups, erumpent, ellipsoid or oblong, or becoming confluent and irregular, up to 3 mm. long and 1 mm. broad, smooth, brownish black, corneo-coriaceous; disc brick red to reddish brown; lips swollen, transversely striate, curling inwards. Asci 8-spored, narrow cylindrical-clavate, rounded above, tapering below to a short foot, 200–240 \times 12.5–15 μ ; wall firm, ca. 1–1.5 μ thick, slightly thickened above (2.5 μ). Paraphyses numerous, sub-hyaline, 2–2.5 μ thick, exceeding the asci; at the tips, yellowish, sub-clavulate, 4–5 μ thick, conglutinate. Spores monostichous, oblong or sub-ellipsoid, broadly rounded at the ends, not tapering towards the ends or tapering slightly, slightly constricted at the septa, dark reddish brown, becoming opaque, 30–40 \times 10–12 μ .

on branches, Somerset East, *MacOwan* 1262, 1264, 1265, 1339; Witte Rivier, Dunbrody, Uitenhage distr., *Hoeg* 97 (Wakefield l.c.); Woodbush, N. Transvaal, *K. M. Putterill*, 31035.

I have not been able to trace MacOwan's specimens, which are all missing from our collections.

192. ***Scolecopeltis Eugeniae*** Doidge nov. sp.

Perithecia hypophylla, sparse, superficialia, facile secedentia opace atro-coerulea, rotundato-scutellata, tenuissime albo-marginata, 450–550 μ lata, margine in alam membranacearum 100–120 μ latam sensim tenuiore et pallidiore ambituque hyalinem abeunte, ex hyphis tenuibus 1–1.5 μ latis reticulatim denseque conjunctis texta, ostiolo distincto

rotundata 45–60 μ lato; asci numerosi, primitus oblongo-clavati, deinde ellipsoidei v. cylindracei, sub-sessiles, 150–160 \times 25–30 μ , ubique crassiuscule tunicati, apice haud incrassati, 4–8-spori; sporae paralleles, anguste clavatae, hyalinae, utrinque rotundatae, 90–120 μ longae (? maturae) supra latiores, 6.5–8.5 μ latae, deorsum sensim attenuatae, infra 3.5 μ latae, valde constrictae et facile secedentes, 4–6-septatae, cellulis sub-globosis.

Hab. in foliis *Eugenia Zeyheri* Harv., Alexandria, leg. Doidge, 22349.

Ascomata hypophyllous, scattered, superficial, readily becoming detached from the leaf surface, black with a thin white margin, more or less circular in outline, 450–550 μ diam. Covering membrane scutellate, opaque in the centre near the distinct round pore which is 45–60 μ diam., pellucid, blue grey or indigo blue near the margin, becoming gradually paler outwards, and thinning out into a hyaline membranous border 100–120 μ broad; covering membrane composed of delicate hyphae 1–1.5 μ thick, which are densely and closely reticulate and interwoven. Asci numerous, 2–8-spored, at first oblong-clavate, then ellipsoid or cylindrical, sessile or sub-pedicellate, rounded above, 150–160 \times 25–30 μ , rather thick-walled, wall 1.5–2 μ thick, not thickened at the apex. Spores parallel, twisted, narrow clavate, hyaline, rounded at both ends, 90–120 μ long, 6.5–8.5 μ broad near the upper end, and tapering gradually downwards to 3.5 μ at the lower end; 4–6-septatae, mostly 5-septate, deeply constricted and falling apart readily; cells sub-globose. Paraphysoids hyaline, poorly developed.

on leaves of *Eugenia Zeyheri* Harv., Alexandria, Cape, Doidge, 22349.

193 *Scolepeltis Morganae* Doidge nov. sp.

Perithecia plerumque hypophylla, opace atro-coerulea, sparsa, superficialia, facile secedentia, 400–450 μ lata, margine in alam membranacearum hyalinem, 50 μ latam ambitu abeunte, ex hyphis 2–2.5 μ latis maeandrice denseque conjunctis contenta, ostiolo distincto nullo, in maturitate centro irregulariter radiatim dehiscencia. Asci numerosi, lanceolati v. fusiformi, 4–8-spori, recti v. curvati, apice rotundati, haud v. vix incrassati, sessiles, 80–90 \times 20–22.5 μ . Sporae primo 2–3-stichae, deinde paralleles, hyalinae, clavatae, 5-septatae, constrictae, 40–65 μ longae, supra conico-rotundatae, 4–7.5 μ latae, deorsum sensim attenuatae, infra 2–3 μ latae, facile in articulos inaequales secedentes.

Hab. in foliis *Myrsinis africanae*, Woodbush, leg. Morgan et Doidge, 30487.

Ascomata mostly hypophyllous, opaque, blue-black, scattered, superficial, easily becoming detached from the leaf, 400–450 μ diam., surrounded by a hyaline zone which is up to 50 μ broad. Covering membrane scutellate, opaque in the centre, sub-pellucid bluish-green near the margin, becoming paler and thinning out rather rapidly into a hyaline, membranous border; not radiating in structure, composed of a close and intricate network of hyphae 2–2.5 μ thick; there is no central pore, at maturity a number of irregularly radiating cracks develop from the centre of the covering membrane. Asci numerous, lanceolate to fusiform, 4–8-spored, straight or curved, rather thin-walled, wall about 1 μ thick, not thickened at the apex or very slightly so, rounded above, sessile, 80–90 \times 20–22.5 μ . Spores at first 2–3-stichous, then parallel, hyaline, clavate, 5-septate, rounded conical at the apex, tapering gradually towards the base, constricted at the septa, 40–65 μ long; 4–7.5 μ broad near the second cell from the upper end, where the spore is broadest, tapering gradually to the lower end where it is 2–3 μ broad; readily breaking up into unequal segments, the lower cells being longer and narrower than the upper. Paraphysoids poorly developed, hyaline, filiform.

on leaves of *Mysine africana* L., Woodbush, Pietersburg distr., Transvaal, Morgan and Doidge, 30487.

194. *Scolepeltis Mysinis* Doidge, nov. sp.

Ascomata plerumque hypophylla, sparsa, superficialia, facile secedentia, atro-coerulea 600–750 μ diam., margine pallidiore in alam membranacearum usque 375 μ latam statim abeunte, scutellata, ubique ex hyphis 2–2.5 μ crassis maeandrice denseque conjunctis

contexta. Asci numerosissimi, 2-4-sporei, clavati v. cylindranei, sessiles, recti v. curvati $150-220 \times 22-25 \mu$, pariete ca. 1.5μ crasso, apice baud v. leniter incrassato. Sporae clavatae v. oblongae, utrinque rotundatae, hyalinae, 3-septatae $60-102.5 \mu$ longae, supra $7.5-11.5 \mu$ latae, deorsum sensim attenuatae, infra $5-7.5 \mu$ latae.

Hab. in foliis *Myrsinis africanae*, Woodbush, leg. Morgan et Doidge, 30486.

Ascomata mostly hypophyllous, scattered, superficial, easily becoming detached from the leaf surface, blue-black, $600-750 \mu$ diam., surrounded by a conspicuous white margin up to 375μ broad. Covering membrane scutellate, with a distinct, sub-circular, central pore about 75μ diam., opaque, blue-black almost to the margin, where it is bluish-green, subpellucid; firmly compacted of closely interwoven hyphae $2-2.5 \mu$ thick, becoming paler and thinning out rather rapidly at the margin into a broad, hyaline, membranous border. Asci extremely numerous, 2-4-spored, clavate to cylindrical, sessile, broadly rounded above, straight or curved, $150-220 \times 22-25 \mu$; wall usually about 1μ thick, not thickened at the apex or slightly so, up to 6μ . Spores mostly clavate, less frequently oblong, rounded at both ends, hyaline, 3-septate, $60-102.5 \mu$ long; the second cell from the upper end is usually the broadest, $7.5-11.5 \mu$ broad, and the spore tapers gradually towards the lower end which is $5-7.5 \mu$ thick. It is possible that there are sometimes more than four spores in the ascus; the number is difficult to estimate in the mature ascus, as the spores fall apart within the ascus into cylindrical to ellipsoid or clavate segments, when they are barely mature. Paraphysoids numerous, very fine, hyaline.

on leaves of *Myrsine africana* L., Woodbush, Pietersburg distr., Transvaal, Morgan and Doidge, 30486; associated with *Sc. Morganae* and often on the same leaves.

195. *Scolecopeltis Strauchii* Doidge nov. sp.

Perithecia hypophylla, sparsa, superficialia, facile secedentia, opace atro-coerulea, rotundato-scutellata, $450-660 \mu$ lata, margine coerulee pellucido et sensim hyalino abeunte; ubique ex hyphis $2-2.5 \mu$ latis maeandrice denseque conjunctis contexta, ostiolo distincto subrotundato $40-45 \mu$ lato: asci pseudoparaphysati, 2-8-sporei, ellipsoidei, breviter pedicellati, recti v. curvati, $90-120 \times 20-24 \mu$; sporae in asco paralleles, longitudine fere ascorum, hyalinae, utrinque attenuatae, apice rotundatae, 10-12-septatae, constrictae, facile in articulos secedentes, cellulis inaequalibus.

Hab. in foliis *Pleurostyliae capensis* Oliv., Alexandria, leg. Doidge et Strauch, 22371.

Ascomata hypophyllous, scattered, superficial, easily detached from the leaf surface, greenish-black, opaque, round to irregular in outline, $450-660 \mu$ diam. Covering membrane scutellate, opaque in the centre, pellucid dull bluish-green near the margin and becoming gradually hyaline towards the outer edge; not radiating in structure, but composed of reticulately and tortuously interwoven hyphae $2-2.5 \mu$ thick; with a distinct sub-circular central pore $40-45 \mu$ diam. Asci very numerous, 2-8-spored, ellipsoid, straight or curved, tapering towards both ends, rounded at the apex, contracted suddenly at the base into a short foot; wall firm, about 1μ thick, not thickened at the apex or very slightly so; $90-120 \times 20-24 \mu$. Spores parallel, straight or slightly twisted and almost the length of the ascus, hyaline, narrow fusiform, $75-100 \mu$ long; $6-8.5 \mu$ thick in the centre and tapering to both ends which are rounded or sub-acute, 10-12-septate, constricted, falling apart very readily at the septa. Paraphysoids numerous, filamentous, hyaline, forming erect masses between the asci which partially isolate them.

on leaves of *Pleurostylia capensis* Oliv., Alexandria, Cape, Doidge and Strauch, 22371.

THE SOUTH AFRICAN SPECIES OF ERYTHRINA.

By
D. G. Collett.

The genus *Erythrina*, as represented in South Africa, comprises plants ranging from shrubs to tall trees. The species generally have large and trifoliate leaves and showy flowers, while several have a large rootstock. Their distribution is predominantly eastern and their occurrence south-west of the Albany district is rare though *E. caffra* is said to thrive well in cultivation in the Cape Peninsula. There are, too, records of the genus from West Africa. A plant which flowered in the Natal Herbarium garden (*D.* 17675) is said to have been grown from seed sent from West Africa by Colonel G. Molyneux, while Galpin collected a specimen near Windhoek (Galpin 14213 in National Herbarium), adding a note that only one plant was seen.

In the following account one species dealt with is known only in cultivation, viz.: *E. Crista-galli* Linn. The flowering shoots of this species die off annually and it requires a considerable length of time for a plant to attain to the height of a tree. Noteworthy, too, is the absence of a definite peduncle, the small groups of pedicelled flowers frequently springing from the axils of the upper leaves. Other cultivated species include *E. constantiana* Micheli, *E. micropteryx* Poepp., *E. corallodendron* Linn., *E. breviflora* DC., all from the Durban Botanic Gardens, but as they are represented in most cases by only a single specimen they are not included in the present descriptions. Two other specimens which flowered in the Natal Herbarium grounds and as yet unnamed, are said to have been grown from seed brought by Colonel Molyneux from East and West Africa.

Of the remaining species the occurrence of *E. acanthocarpa* E. Mey., the Tambokkie Thorn, is limited to the Queenstown-Tarkastad-Cathcart area of the eastern Cape Province where these shrubs are said to form dense thickets. This species is distinguished by its green-tipped, scarlet flowers, spinous legume, and comparatively small leaflets, and has a long succulent "root." According to Marloth the tissue of this underground rhizome is filled with water as a reserve against prolonged drought.

The species with the tallest trees, sometimes up to 60 feet high, is *E. caffra* Thunb., the Kaffirboom. Although the brilliant scarlet flowers appear before the foliage, the patches of red form an attractive picture against the background of grassy plains on which the trees are often to be found. In the warm, subtropical climate of Natal the flowers appear earlier than they do further south in the Albany district, sometimes before the end of June when the foliage of the previous season has not yet entirely disappeared. Pegler states that natives regard the flowering of this tree as a sign to begin ploughing. Bayer in "An Account of the Plant Ecology of the Coastbelt and Midlands of Zululand" (Annals of the Natal Museum, Vol. VIII) observes that *E. caffra* becomes established under the shade of the palm, *Phoenix reclinata*. He further cites this species in a list of plants typical of the forest margin which do not occur within the forest itself, being killed out as a result of over-shadowing by taller forest trees.

Hutchinson (Kew Bulletin, 1933) has recognised a species *E. lysistemon*, found in the Transvaal and formerly included in *E. caffra*, from which, however, it is distinguished by the possession of a vexillary stamen quite free from the split staminal-tube. Though this species may be confined to the Transvaal, *E. caffra* also occurs within this territory.

E. latissima E. Mey. is a stout branching tree cited by Bayer (An Account of the Plant Ecology of the Coastbelt and Midlands of Zululand) as a constituent of open tree veld.

On the grassy hill slopes of Natal these scattered trees, 15–20 feet high, are conspicuous for their robust appearance. Smaller than this are the shrubby species *E. Humeana*, Spreng. and *E. Zeyheri* Harv., easily distinguishable by the coarser appearance of the latter with its larger and more prickly leaves and larger stipules. *E. Zeyheri* has a large, corky underground stem and extends inland further west than *E. Humeana*.

Economically the genus is not important. Because *E. caffra* is easily propagated vegetatively, it is employed in the construction of live fences round kraals, and with other species is cultivated for ornamental purposes. Burt-Davy in "A Manual of the Flowering Plants and Ferns of the Transvaal with Swaziland" affirms that the very light underground stem of *E. Zeyheri* has been used as a substitute for cork, and dried and smoked as a remedy for asthma. Watt and Breyer-Brandwijk (The Medicinal and Poisonous Plants of Southern Africa) state that a leaf paste of *E. caffra* is one of the ingredients of a poultice applied by the Zulus over the bladder in suspected disease of that organ, the skin being greased before application. A similar poultice is used in the local treatment of venereal sores. The same authors declare that a decoction of the root of *E. Humeana* is used as a fomentation, and by the mouth in tuberculosis. It is sometimes used for other chest conditions, e.g. bronchitis, while the Zulus and Swazis use the bark of *E. Zeyheri* as an ingredient in a decoction taken by the mouth for rheumatism, boils, and "blood disorders".

According to Watt and Brandwijk, seed of *E. Zeyheri* yields 28 per cent. of a fixed oil which is purgative and 4 per cent. of a volatile oil containing an alkaloid now generally known as *zeyherine*, previously as *erythrine*. This alkaloid has been recommended for tuberculosis. The volatile oil also contains *erythrol* which has a pungent odour like horse-radish and is a powerful irritant. It can be used in a liniment for counter-irritation. The Union Division of Forestry has received enquiries from America concerning the availability of seeds of *Erythrina* spp. for which a demand is anticipated if the extraction of their alkaloids proves successful. The coral red seeds are utilised by Kaffir women in the manufacture of necklaces.

Acknowledgment is made to the following herbaria for the loan of specimens: Transvaal Museum, Pretoria (T. M.), Natal Herbarium, Durban (D.), Albany Museum, Grahamstown (G.).

In conclusion I express my gratitude to Dr. E. P. Phillips, Chief of the Division of Botany and Plant Pathology, and to Dr. R. A. Dyer for their sympathetic assistance while I was engaged in this work.

Erythrina Linn. Sp. Pl. ed. I. 706 (1753).

Coraliodendron Mill. Gard. Diet. Abrdg. ed. 4 (1754).

Mouricou Adans. Fam. II. 323 (1763).

Xyphanthus Rafin. Fl. Ludov. 103 (1817).

Chirocalyx Meisn. in Hook. Lond. Journ. Bot. II. 97 (1843).

Micropteryx Walp. in Linnæa. XXIII. 739 (1850).

Duchassaingia Walp. l. c. 741.

Macrocybium Walp. in Flora. XXXVI. 194 (1853).

Stenotropis Hasskarl Retzia, l. 183 (1855).

Hypaphorus Hasskarl Hort. Bogor. I. 197 (1858).

Shrubs or trees ranging from 0.3 m. to 17 m. in height. *Stem* generally woody and branched, but subterranean and corky in *E. Zeyheri*; branches woody, leafy, armed with prickles, glabrous or tomentose, but then becoming glabrous with age. *Leaves* pinnately 3-foliate, alternate, petioled, often arising in clusters at the apex of the stem in *E. Zeyheri*, in the other species generally scattered along the branches or sometimes clustered towards the ends of the branchlets; leaflets with or without prickles on the veins on one or both surfaces, eventually glabrous but sometimes tomentose when young; petiole terete and without furrows or furrowed, armed or unarmed, tomentose, puberulous or glabrous; terminal leaflet ovate, obovate, elliptic or ovate long-acuminate, sometimes broader than

long, obtuse to acute, rarely apiculate, with a pair of basal glands; petiolule of terminal leaflet frequently armed with prickles, white-tomentose, puberulous, or glabrous; lateral leaflets ovate, obovate, elliptic or ovate long-acuminate, occasionally broader than long, obtuse to acute, very rarely apiculate, sometimes unequal-sided, with a pair of glands at the base. *Stipules* ovate, oblong or linear, white tomentose, pubescent or glabrous. *Peduncle* woody, naked, often furrowed, armed or unarmed, tomentose to puberulous, but becoming glabrous with age. *Racemes* terminal and densely, or rarely lateral and laxly, many-flowered except in *E. acanthocarpa* where the short racemes are few-flowered. *Flowers* brilliant scarlet to dull crimson, tipped with green in *E. acanthocarpa*, showy, frequently pendulous, appearing before or with the leaves. *Bracts* ovate, ovate-rotund, oblong or linear-obovate, densely tomentose to puberulous, deciduous; bracteoles linear, woolly-villous to puberulous, frequently deciduous. *Calyx* tubular to campanulate, 2-lipped or sub-truncate, frequently obscurely 5-lobed, very rarely as broad as long, in *E. latissima* ovate or obovate and with the tube cleft below nearly to the base and the upper side produced into 5 apical linear or linear-lanceolate lobes, densely woolly-villous to puberulous, but glabrous in *E. Crista-galli*. *Vexillum* ovate, obovate, elliptic, oblong-obovate or elliptic-oblong, obtuse, frequently emarginate, with a short basal claw, glabrous, sometimes minutely velvety; keel roughly ovate, obovate or oblong, acuminate in *E. acanthocarpa*, sometimes truncate and with a lateral mucro above, in *E. Humeana* frequently with a lateral lobe, keel petals sometimes free, shortly narrowed at the base, very rarely not narrowed; wings ovate or roughly oblong to obovate, frequently curved and narrowing slightly above, shortly clawed at the base, longer or shorter than the keel, with a ventro-lateral lobe on each side in *E. acanthocarpa*. *Stamens* diadelphous, with the filaments free above and united into a split tube below except the vexillary filament which is free to its base in *E. lysistemon* but is united to the staminal-tube for varying lengths in the other species; anthers linear, 2-theous, dehiscing by longitudinal slits, dorsifixed. *Ovary* linear, many-ovuled, densely tomentose, on a gynophore; style linear, hispid below, glabrous above, rarely glabrous along its whole length; stigma small, simple, terminal. *Pods* (in those species seen) dark, subligneous, stalked, falcate, armed with prickles only in *E. acanthocarpa* constricted between the seeds and with these constrictions frequently elongated. *Seed* red, elliptic, with a scar of attachment.

KEY TO THE SPECIES.

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|---|----------------------------|
| 1. Peduncle and calyx whitish woolly-villous; calyx with 5 apical linear lobes, cleft nearly to the base on the lower side..... | 1 <i>E. latissima</i> . |
| Peduncle and calyx not woolly-villous; calyx sub-truncate or 2-lipped, but not cleft to the base..... | 2 |
| 2. Keel almost as long as the vexillum..... | 7 <i>E. crista-galli</i> . |
| Keel about $\frac{1}{2}$ to $\frac{1}{3}$ as long as the vexillum..... | 3 |
| 3. Calyx distinctly 2-lipped..... | 4 |
| Calyx truncate or almost so..... | 5 |
| 4. Vexillary stamen free to the base, possibly adhering to, but not adnate to, the split staminal-tube..... | 2 <i>E. lysistemon</i> . |
| Vexillary stamen adnate to the split staminal-tube for about 1 cm. below.. | 3 <i>E. caffra</i> . |
| 5. Terminal leaflet obovate, less than 5 cm. long; keel longer than the wings; legumes spinous..... | 4 <i>E. acanthocarpa</i> . |
| Terminal leaflet ovate or elliptic, rarely obovate, usually 5 cm. or more long; keel shorter than the wings; legumes unarmed..... | 6 |
| 6. Filaments free above for at least half the length of the longest stamens; leaflets sometimes with a few prickles on the veins beneath..... | 5 <i>E. humeana</i> . |
| Filaments free for less than half, about $\frac{1}{3}$ the length of the longest stamens; leaflets well armed with prickles on the veins beneath..... | 6 <i>E. zeyheri</i> . |

1. *E. latissima* *E. Mey.* Comm. Pl. Afr. Austr. 151 (1835).

Chirocalyx mollissimus Meisn. in Hook Lond. Journ. Bot. II. 98 (1843).

Erythrina sandersoni Harv. Thes. Cap. I. 39 (1859).

E. tomentosa R. Br. sec. Wood Natal Plants, IV. iv. tab. 384-385 (1906), non R. Br.

E. abyssinica Lam. sec. Marloth Fl. South Afr. II. 1. 81 (1925), non Lam.

A tree, 3-7 m. high. *Branches* woody, armed with prickles, densely tomentose, becoming glabrous with age. *Leaves* with the veins of the leaflets occasionally armed with prickles, generally unarmed, variously pubescent, sometimes puberulous or at first densely tomentose above and below but becoming glabrous with age, the upper surface losing its tomentum first; petiole woody, 13-30 cm. long, up to 0.9 cm in diam., shallowly furrowed, unarmed, densely whitish tomentose to puberulous, becoming glabrous with age; terminal leaflet 5.5-30 cm. long, 7.5-31.5 cm. broad, broadly ovate, broader than long, obtuse; petiolule of terminal leaflet 5-16.5 cm. long, densely whitish-tomentose to puberulous, becoming glabrous; lateral leaflets 7-21 cm. long, 7-21.5 cm. broad, broadly ovate, frequently broader than long, obtuse, unequal-sided. *Stipules* ovate, densely white-tomentose. *Peduncle* 12-24 cm. long, not furrowed, unarmed, at first densely white-tomentose, becoming glabrous. *Raceme* terminal, densely many-flowered, 4-8 cm. long. *Flowers* dull crimson, showy, erect when in bud, but becoming pendulous as they mature. *Bracts* membranous, 1.2-2 cm. long, linear-obovate, densely white-tomentose; bracteoles up to 2 cm. long, linear, woolly-villous. *Pedicel* 0.4 cm. long, densely villous. *Calyx* 3-4.1 cm. long, 0.8-1.1 cm. diameter across the middle of the tube, ovate or obovate, with the tube cleft nearly to the base on the lower side and the upper side produced into 5 apical linear or linear-lanceolate lobes about 1/3 length of the calyx, densely woolly-villous. *Vexillum* 3.1-6.3 cm. long, 1.5-2.7 cm. broad across the middle, elliptic or oblong-obovate, obtuse, emarginate, with a short basal claw, glabrous; keel 1.3-1.9 cm. long, 1-1.4 cm. broad across the middle, keel petals free, obovate, shortly narrowed at the base; wings 1.7-2.8 cm. long, 0.8-1 cm. broad at the middle, obovate-oblong, curved, narrowed at the base, longer than the keel. *Filaments* 2.8-5.2 cm. long, vexillary filament free to the centre of the staminal-tube, the rest free above for approximately 1/3 the length of the longest stamens; anthers 2.5-4 mm. long. *Ovary* 1.5-2 cm. long; style 1.2-2 cm. long, linear, hispid below, glabrous above; stigma capitate.

Cape Province: Kentani district, *Peyler* 235, Sept., 1903, Oct., 1907 (N.H., G.); Umzimkulu district, Clydesdale, *Tyson* 1053 (N.H.).

Natal: Umzinto district, Ifafa, *Lansdell* (N.H. 16114); Durban district, Port Natal, *Krauss* 263 (N.H. 9326); unknown collector, *N.H.* 14466; Zululand, *Harris* (D. 28844).

Swaziland: Mbabane district, *Nicholson* (N.H. 22996).

Transvaal: Barberton district, Logogotu, *Holt* 334 (N.H.).

The following specimens consisting of leaves only may belong to this species:—

Transvaal: Barberton district, Barberton, *Smith* 7051 (N.H.), *Oranje in Herb.* Burt-Davy (N.H. 23296), Nelspruit, *Mogg* 13979 (N.H.); Pietersburg district, Houtboschberg, *Nelson* 382 (T.M. 11626).

The identity of the following specimens is doubtful. Possibly they should be included under *E. latissima*:—

Cape Province: Transkei, *Miller* (N.H. 23297).

Transvaal: Pietersburg district, Woodbush, *Hoffmann* 143 (T.M. 30424).

The following are cultivated specimens:—

Natal: Durban, in Botanic Gardens, *Wood* (D. 3579).

Cape Province : Kingwilliamstown, grown from seeds from Umtata, *Sim* 1362 (N.H.). This specimen probably belongs here.

Transvaal : Pretoria, cultivated in Division of Botany and Plant Pathology gardens, origin unknown, *Collett* (N.H. 24192).

The species, as here represented, is very variable as regards vegetative features, the amount of tomentum on the leaves in particular presenting a problem, the solution to which can probably be found only by an examination of material in the field. It is possible that two distinct species exist. However, because the floral structure appears uniform and because the dried herbarium material available does not warrant the creation of an additional species, the specimens formerly known as *E. latissima* E. Mey. have been left under that name.

2. *E. lysistemon* Hutch. in Kew Bull. 1933, 422.

A tree up to 7 m. high. *Stem* woody, branched; branches woody, leafy, covered with prickles. *Leaves* scattered or clustered towards the ends of the branchlets, unarmed, glabrous; petiole about 8.5 cm. long, shallowly furrowed, sometimes armed with one or two prickles, puberulous when young but becoming glabrous; terminal leaflet 9.5 cm. long, 8.5 cm. broad, broadly ovate, long acuminate, narrowing at the base, subobtusate; petiolule of terminal leaflet about 4 cm. long, sometimes bearing one or two prickles when young; lateral leaflets 8–9 cm. long, 6.5–8 cm. broad, broadly ovate, long acuminate, narrowing at the base, sub-obtusate, unequal-sided, with a pair of basal glands. *Stipules* 0.3 cm. long, ovate, pubescent when young, becoming glabrous, deciduous. *Peduncle* 6–24 cm. long, faintly furrowed, unarmed, pubescent at first, becoming glabrous. *Racemes* terminal, densely many-flowered, 2–6 cm. long. *Flowers* red, showy, pendulous, appearing before the leaves. *Bracts* ovate, pubescent, deciduous; bracteoles minute, linear, pubescent. *Pedice*l 0.2 cm. long. *Calyx* 1.1–1.4 cm. long, 0.7–0.9 cm. diameter above, campanulate, 2-lipped, upper lip sometimes shallowly 2-fid, tomentose. *Vexillum* 2.4–5.9 cm. long, 1.1–2.1 cm. broad across middle, obovate or elliptic, obtuse, sometimes emarginate, with a very short basal claw, glabrous; keel 0.7–1 cm. long, 0.3–0.5 cm. broad across the middle, oblong to obovate, narrowed at the base; wings 1–1.1 cm. long, 0.3–0.4 cm. broad across the middle, roughly oblong, narrowing above, curved, narrowed at the base, slightly longer than the keel. *Filaments* 2–3.6 cm. long, with the vexillary filament free to the base, possibly adhering to, but not adnate to, the split staminal-tube, and with the remaining filaments free for 0.7–1.1 cm. above; anthers 0.25 cm. long. *Ovary* 1–1.7 cm. long; style 0.9–1.7 cm. long, linear, hispid; stigma small, capitate. *Pods* stalked, constricted between the seeds, almost glabrous.

Transvaal : Belfast district, Crocodile River, *Smuts* 66 (N.H. 24193, **Type**); Pretoria district, Silverton, *Leemann* (N.H. 22845); Zoutpansberg district, Wylies Poort, *Taylor* 732 (N.H.).

Possibly the following two specimens belong to this species, the vexillary filament appearing to be not typically adnate and yet not distinctly free as in the above three cases :—

Swaziland : *Stewart* (T.M. 8924).

Transvaal : Barberton district, near Barberton, *Legat in Herb. Burt-Davy* (N.H. 26303).

3. *E. caffra* Thunb. Prodr. Pl. Cap. 121 (1800).

E. viarum Todaro Nouvi Generi e Nuove Specie di Piante 62 (1861).

E. insignis Todaro l c. 66.

A tree 7–17 m. high. *Stem* woody, branched; branches woody, leafy, armed with prickles. *Leaves* scattered or clustered at the ends of the twigs, unarmed, glabrous.

petiole 6-16 cm. long, furrowed, sometimes with one or two small prickles when young but unarmed when mature, puberulous when young, becoming glabrous; terminal leaflet 8-16 cm. long, 8-18 cm. broad, broadly ovate, occasionally elliptic, frequently broader than long, subacute; petiolule of terminal leaflet 3-8 cm. long, unarmed; lateral leaflet 7.5-13 cm. long, 5-12 cm. broad, ovate, subacute, unequal-sided. *Stipules* minute, ovate, puberulous, deciduous. *Peduncle* 9-18 cm. long, terete, unarmed, tomentose when young, becoming glabrous. *Racemes* terminal, densely many-flowered, 2-4.5 cm. long, rarely half the length of the peduncle. *Flowers* brilliant scarlet, showy, pendulous, appearing before the leaves. *Bracts* membranous, ovate, pubescent, early deciduous; bracteoles minute, linear, pubescent. *Pedice* 0.2-0.6 cm. long, pubescent. *Calyx* 1-1.9 cm. long, 0.8-1.2 cm. diameter above, campanulate, 2-lipped, becoming broader and splitting more deeply with age, tomentose. *Vexillum* 3.5-5.4 cm. long, 1.4-2.8 cm. broad across the middle, obovate or elliptic, obtuse, sometimes emarginate, with a short basal claw, glabrous; keel 0.8-2.1 cm. long, 0.4-1.4 cm. broad across the middle, roughly oblong, ovate or obovate, shortly narrowed at the base; wings 0.9-2.4 cm. long, 0.3-1.1 cm. broad across the middle, roughly oblong or obovate, narrowing slightly above, frequently curved, narrowed at the base, slightly longer than the keel. *Filaments* 2.9-5.1 cm. long, with the vexillary filament adnate for 1-1.8 cm. below and the rest free for 0.9-1.5 cm. above; anthers 3-4.5 mm. long. *Ovary* 1.4-2.7 cm. long; style 1.7-3.2 cm. long, hispid below, sometimes glabrous above; stigma simple, capitate. *Pods* black, sublignous, about 12 cm. long, stalked, unarmed, deeply constricted between the seeds and with these constrictions frequently elongated, densely tomentose when young, becoming glabrous when old. *Seeds* bright red, elliptic, with a linear scar of attachment.

Cape Province: Bathurst district, Kleinemund River, *MacOwan* 1434 (G.); Albany district, Grahamstown, Howieson's Poort, also Port Alfred, *Galpin* 67 (N.H., G.); King-williamstown district, Pirie, *Sim* 2135 (N.H.); Komgha district, near Komgha, *Flanagan* 319 (N.H.); Kentani district, *Pegler* 89 (N.H., G., collected various dates), *Pegler* 1134 (N.H.).

Natal: Durban district, Durban, *Thode* A1514 (N.H. 18213), Berea, *Wood* 10016 (N.H. D. 10806), *Forbes* 350 (D. 18392), *Lansdell* (N.H. 1455); Camperdown district, Cato Ridge, *McClean and Ogilvie* (D. 27899); Zululand, Eshowe, *Rogers* 24455 (T.M. 24020), Mtunzini, *Thode* A1528 (N.H. 18227), St. Lucia Bay, *Pole Evans* 3648 (N.H.), Zululand, Farm Egoa, *Curson* (N.H. 23016).

Transvaal: Barberton district, Saddleback Range, *Galpin* 494 (N.H., G.); Lydenburg district, Lydenburg, *Barnard* 531 (N.H.); Pretoria district, Pretoria, *Leendertz* 217 (G., T.M. 8334), Water Tower Hill, *Mogg* 15157 (N.H.); Pietersburg district, Woodbush, *Jenkins* (T.M. 7339); Zoutpansberg district, Louis Trichardt, *Breyer* (T.M. 24377).

The following specimen was grown in the garden of the Division of Botany and Plant Pathology, Pretoria:—

Transvaal: *Phillips* (N.H. 1648).

In the National Herbarium are records of two forms of this species with pink and yellow flowers. One was collected at Mbabane in Swaziland (*Nicholson* in N.H. 22847) and the other is a specimen from a plant cultivated in the Native Garden, Willowvale district (Forest Dept. Herb. 8865).

Pink-flowered specimens are also found growing in the Durban Botanic Gardens and in the garden of the Natal Herbarium. As it is not certain whether these "sports" occur wild as well as in cultivation, the creation of a variety is not yet justified. *Marloth* states that the occasional occurrence of these pale-coloured flowers is due to the absence of the red pigment in the epidermal cells. This explanation, of course, does not exclude the possibility of the "sport" being an inheritable mutation.

It is impossible to tell whether the following incomplete specimens should be included included in *E. caffra* Thunb. or in *E. lysistemon* Hutch :—

Transvaal: Barberton district, Nelspruit, *Pole Evans* 3927 (N.H.); Pilgrims Rest district, Bushbuck Ridge, *Smuts and Gillett* 2344X (N.H.); Pretoria district, Schanskop, *Mogg* 15742 (N.H.); de Wildt, *Murray* (N.H. 23298), Wonderboompoort, *Leendertz* 953 (T.M. 8335); Rustenburg district, Rustenburg, *Leendertz* 3304 (T.M. 9801), *Turner* 1b (N.H.); Pietersburg district, Woodbush, *Hoffmann* 24 (T.M. 29179); Zoutpansberg district, *Bailey in Herb. Burt-Davy* (N.H. 26302), *Smuts* (N.H. 23299), Baiandbai, *Lang* (T.M. 32266).

E. Humeana Spreng. sec. Eckl. & Zeyh. Enum. Pl. Afr. Austr. Extratrop. 259 (1835), non Spreng.

A rigid shrub, 1–2 m. high. *Root* long and succulent, very light when dry. (Fl. Cap. II, 237). *Stem* woody, branched; branches woody, leafy, covered with recurved prickles. *Leaves* scattered along the branches and with or without a prickle at the base of the petiole, with the mid-rib armed with one or two small prickles beneath, pubescent when young becoming quite glabrous; petiole slender, 2–4 cm. long, armed with 2 or 3 recurved prickles, puberulous; terminal leaflet 3–3.5 cm. long, 2.5–3.5 cm. broad, broadly obovate or transversely elliptic, very nearly as broad as long, or broader than long, triangular apiculate or rounded above; petiolule of terminal leaflet 1.5–2.5 cm. long, with one or two prickles, puberulous; lateral leaflets 2.5–3.5 cm. long, 2–3 cm. broad, obovate to longitudinally elliptic, apiculate or sub-acute, frequently unequal-sided. *Stipules* minute, subulate, villous, deciduous. *Peduncle* 1–12 cm. long, sometimes furrowed, unarmed, tomentose when young, becoming glabrous. *Racemes* terminal or lateral, comparatively lax, few-to many-flowered, extending the whole, or nearly the whole, length of the peduncle. *Flowers* scarlet, tipped with green, erect or horizontal, appearing with the leaves. *Bracts* ovate-rotund; bracteoles linear, bracts and bracteoles minute, densely pubescent, deciduous. *Pedice* 0.6–0.8 cm. long, pubescent. *Calyx-tube* 1.2–1.7 cm. long, 1–1.7 cm. diameter above, broadly campanulate, sometimes as broad as long, subtruncate, obscurely 5-lobed, pubescent. *Vexillum* 4.2–5.5 cm. long, 2–3.2 cm. broad across the middle, elliptic-oblong, obtuse, emarginate, with a very short basal claw, minutely velvety; keel 1–1.5 cm long, 0.2–0.4 cm. broad across the middle, ovate or triangular ovate, acuminate, shortly narrowed at the base; wings 0.4–0.6 cm. long, 0.2 cm. broad below, ovate-acuminate, with a ventro-lateral lobe on each side, narrowed at the base, shorter than the keel. *Filaments* 3.4–5.2 cm. long, the vexillary filament free nearly to the base and the rest free above for more than half the length of the split staminal-tube: anthers 3–4 mm. long. *Ovary* 1.6–2.6 cm. long, broadly linear; style 1.8–3.2 cm. long, linear, hispid below, glabrous above; stigma small, capitate. *Pods* woody, 10–25 cm. long, curved, constricted, or not between the seeds, covered with numerous small straight prickles, stalked, at first tomentose but glabrous when old.

Cape Province: Albany district, Grahamstown, Botanical Gardens, *Marsh* (G.); Queenstown district, Queenstown, *Pole Evans* (N.H. 2997), *Rogers* (G.), grassy plains, Queenstown, *Galpin* 1653, Oct.–Nov. 1893 (N.H., G.); Cathcart district, north of Cathcart near Tylden, also near Imvani, and along Queenstown road, plentiful along the Tarkastad road from Queenstown near Carlsrust Siding and Bowkers Park, in thorn country only *Reynolds* 1606 (N.H.).

5. **E. Humeana** Spreng. Syst. Veg. III. 243 (1826).

E. Humei E. Mey. Comm. Pl. Afr. Austr. 150 (1835).

E. hastifolia Bertol. f. in Mem. Acc. Sc. Bolog. II. 568 (1850).

E. Raja Meisn. in Hook. Lond. Journ. Bot. II. 96 (1843).

E. caffra Thunb. sec. Ker-Gawl. Bot. Reg. IX. tab. 736 A, B (1823), non Thunb.

E. caffra Thunb. sec. Sims Bot. Mag. L. tab. 2431 (1823), non Thunb.

E. caffra Thunb. sec. DC. Prodr. II. 412 (1825), non Thunb.

E. caffra Thunb. sec. Reichb. Fl. Exot. V. tab. 312 (1836), non Thunb.

A shrub. *Branches* woody, leafy, armed with prickles. *Leaves* scattered along the branches, with the veins of the leaflets sometimes armed with a few small prickles on both surfaces or only on the lower, glabrous; petiole 5–14 cm. long, not prominently furrowed, bearing recurved prickles, puberulous when young; terminal leaflet 5–13 cm. long, 4·5–12 cm. broad, broadly ovate to elliptic, or ovate long-acuminate, sometimes broader than long, obtuse or sub-acute; petiolule of terminal leaflet 3·5–9 cm. long, bearing prickles; lateral leaflets 4·5–13 cm. long, 4–8 cm. broad, ovate, elliptic, or ovate long-acuminate, sub-acute. *Stipules* 0·5–1 cm. long, ovate or linear, deciduous. *Peduncle* 20–48 cm. long, terete, rarely furrowed, sometimes bearing prickles, pubescent when young, becoming glabrous with age. *Racemes* terminal, densely flowered above, more laxly below, 6–10 cm. long, rarely longer, but lengthening as the fruits ripen. *Flowers* red, showy, pendulous, appearing with the leaves. *Bracts* ovate or oblong; bracteoles linear; bracts and bracteoles minute, puberulous, deciduous. *Pedice* 0·4 cm. long. *Calyx-tube* 0·9–1·3 cm. long, 0·6–0·8 cm. diameter above, tubular, subtruncate, shortly 5-lobed, puberulous. *Vexillum* 3·8–5 cm. long, 1·4–2·1 cm. broad across the middle, obovate or elliptic-obovate, obtuse, frequently emarginate, with a short basal claw, glabrous; keel 0·6–0·8 cm. long, 0·3–0·4 cm. broad, roughly oblong or ovate, narrowed at the base, frequently with a median or ventral lateral lobe and tapering above; wings 0·6–1·2 cm. long, 0·3 cm. broad across the middle, roughly oblong, narrowing above, curved, clawed at the base, longer than the keel. *Filaments* 3–3·4 cm. long, with the vexillary filament free almost to the base of the staminal-tube and the rest free for 1·7–2·3 cm. above, i.e. for at least half the length of the longest stamens; anthers 2 mm. long. *Ovary* 1·2–2 cm. long; style 1·5–1·9 cm. long, sparsely hispid; stigma small, terminal. *Pods* black, subligneous, 12–16 cm. long, stalked, unarmed, deeply constricted between the seeds, pubescent when young, becoming glabrous. *Seeds* red, elliptic, laterally compressed, with a scar of attachment.

Cape Province : Eastern Cape Province, *Drege* (N.H. 9325); Bathurst district, coast belt near Fish River Lighthouse, *Dyer* 2263 (G), Coombs Vale, *Bennie* (G.); Albany district, Southwell, *Schönland* (N.H. 22921), Botha's Hill, *MacOwan* (G); East London district, East London, *Galpin* 3388 (N.H.), "Overton", 11 miles west of East London, *Hilner* 161 (G.), Keiskama mouth, *Galpin* 7693 (N.H.), Stutterheim district, Fort Cunningham, *Sim* 2136 (N.H.); Komgha district, near Komgha, Flanagan 125, January, 1890, 1891 (N.H., G.); Kentani district, *Pegler* 1179 (N.H., G.).

Natal : Durban district, Umgeni, *Wood* 13078 (D.), Botha's Hill, *McClellan* 134 (N.H.), Intshanga, *Wood* 9776 (D., G.), New Germany, *Wood* 12652 (N.H.); Richmond district, Byrne, *Galpin* 11906 (N.H.); Greytown district, *Wylie* (D. 22344, T. M. 34029); Vryheid district, Goben Hills, *Pole Evans* 2637 (N.H.); Mount Ashley, *Mogg* 6360 (N.H.); Zululand, Somkeli district, *Wood* 9224 (N.H.).

Swaziland : Mbabane district, Mafutane, *Bolus* 11831 (N.H.).

Transvaal : Ermelo district, Billy's Vlei, *Burt-Davy* 9326 (N.H.); Carolina district, Steynsdorp, *Dieperink* 87 (N.H.); Pietersburg district, Zoekmekear, *Botha* (N.H. 23017); Zoutpansberg district, Louis Trichardt, *Breyer* (T.M. 19416).

Portuguese East Africa : Lourenco Marques district, Rikatla, *Junod* (T.M. 20185).

The following scanty specimens should probably be included in this species:—

Cape Province : East London district, Southernwood, *Smith* 3642 (N.H.).

Transvaal : Barberton district, Barberton, *Rogers* (T.M. 24277).

Possibly the specimen marked "Bottom of Woest Hill, 466" (G) should be included here.

Cultivated specimens of this species include the following:—

Cape Province : "The Hill", Claremont, near Cape Town, *Marloth* 9337 (N.H.); Eastern Cape Province, originally from Port Alfred, flowered in Dr Becker's garden (G.).

Transvaal: Pietersburg district, Pietersburg, from the park, *Stapleton* (N.H. 22854, 22920).

6. **E. Zeyheri** Harv. in Flor. Cap. II. 236 (1861-62).

A shrub 0·3-0·5 m. high. *Stem* subterranean, corky. *Leaves* arising in clusters at the apex of the stem or from short terminal branches, with the leaflets prominently veined beneath and with the veins generally puberulous and armed with prickles on both surfaces or on the lower only; petiole 8-20 cm. long, often prominently furrowed, covered with recurved prickles, puberulous; terminal leaflet 10-26 cm. long, 8-21 cm. broad, but occasionally up to 30 cm. long and 25 cm. broad, broadly ovate or elliptic, rarely obovate, occasionally as broad as long, obtuse or subacute; petiolule of terminal leaflet 4-14 cm. long, bearing prickles; lateral leaflets 10-21 cm. long, 5-12 cm. broad, ovate to elliptic, obtuse to acute, frequently unequal-sided. *Stipules* coriaceous, 1-2 cm. long, ovate or oblong, glabrous, or occasionally puberulous. *Peduncle* 19-38 cm. long, often furrowed sometimes bearing a few small prickles, pubescent when young, becoming glabrous with age. *Racemes* terminal, densely many-flowered, 2·5-8 cm. long. *Flowers* red, showy, pendulous, appearing with the leaves. *Bracts* ovate or oblong, deciduous; bracteoles minute, linear, pubescent. *Pedicel* 0·4 cm. long. *Calyx-tube* 1·2-1·5 cm. long, 0·7 cm. diameter across the middle, tubular-campanulate, sub-truncate, shortly 5-lobed, puberulous. *Vexillum* 3·4-4·4 cm. long, 1·4-1·9 cm. broad across the middle, obovate, obtuse, sometimes emarginate, with a short basal claw, glabrous; keel 0·7-1 cm. long, 0·4-0·5 cm. broad across the middle, roughly oblong or ovate, frequently truncate and with a lateral mucro above, narrowed at the base; wings 0·9-1·5 cm. long, 0·3-0·5 cm. broad across the middle, oblong to obovate, frequently curved, clawed at the base, longer than the keel. *Filaments* 3-4 cm. long, with the vexillary filament free nearly to the base of the staminal-tube and the rest free for about 1 cm. above, i.e. for $\frac{1}{3}$ the length of the longest stamens; anthers 2 mm. long. *Ovary* 1·3-1·5 cm. long; style 1·6-2 cm. long, linear, sparsely hispid; stigma small, terminal. *Pods* dark, subligneous, 8-20 cm. long (Fl. Cap.), stalked, unarmed, constricted between the seeds and with these constrictions frequently elongated, pubescent when young, becoming puberulous. *Seeds* red, elliptic, with a linear scar.

Natal: Estcourt district, Mooi River, *Wood* 4076 (D. 4596); Weenen district, Mabelston, *Mogg* 3085 (N.H.); Dundee district, Amanga valley, native collector (N.H. 21765).

Basutoland: Mafeteng district, *Dieterlen* 547 (N.H.).

Orange Free State: Vrede district, Vrede, *Langham* (D. 12129); Senekal district, Doornkop, *Goossens* 810 (N.H.); between Senekal and Bethlehem, *Flanagan* 1827 (N.H.); Kroonstad district, Kroonstad, *Pont* 530 (N.H. 22840), near Valsch River, *Pont* 530 (N.H. 22841), East Hill, *Standard VII* DI (N.H. 22842).

Transvaal: Barberton district, Komatipoort, *Rogers* 12963 (T.M. 13737); Wakkerstroom district, Wakkerstroom, *van Dam* (T.M. 24352); Volksrust district, Volksrust, *Jenkins* (T.M. 9294); Ermelo district, Ermelo, *Hoffe* 16 (N.H.), Spitskop, *Pott* (T.M. 15084), on farm Nooitgedacht, *Henrici* 1210 (N.H.), Lake Chrissie, *Galpin* 710 (N.H.); Belfast district, Belfast, *Leendertz* 2681 (T.M. 8058); Bethal district, Bethal, *Leendertz* 3533 (T.M. 9331); Middelburg district, Middelburg, *Jenkins* (T.M. 9211), Witbank, Zondagsfontein, *Thode* A2799 (N.H. 19501, D. 26113), Klein Olifants River, *Young* A5 (T.M. 32510); Vereeniging district, Vereeniging, *Leendertz* 3899 (T.M. 10870), *Marloth* 8106 (N.H.); Pretoria district, on road to Tygerpoort, *Verdoorn* (N.H. 22839), Irene, *Pole Evans* (N.H. 22843) and *Leendertz* 693 (T.M. 8336), Fountains Valley, *Repton* 207 (N.H.), Scurfde Bergen, *Swierstra* (T.M. 6231); Boksburg district, Boksburg, *Breyer* (T.M. 15005); Johannesburg district, Klipriviersberg, *Marloth* 3848 (N.H.); Potchefstroom district, on the grassy, stony hills and on the banks of the Mooi River, *Zeyher* 531 (N.H. 9324, G., *Type*), Klerksdorp district, Klerksdorp, *Nelson* 223 (T.M. 11617).

The following specimens almost certainly belong to this species but are too scanty for precise examination :—

Natal : Newcastle district, near Newcastle, *Saunders* (D. 3440).

Basutoland : Leribe district, *Dieterlen* 547 (D. 13910).

Orange Free State : Heilbron district, *Brandmuller* 126 (N.H.); Sand River Vals River, valleys of Witte Bergen, *Barber* 646 (G.).

Transvaal : Wakkerstroom district, Wakkerstroom, *Pole Evans* (N.H. 26304); Carolina district, Carolina, *Rademacher* (T.M. 7495, 7503), *Galpin* 12989 (N.H.), Standerton district, Standerton, *Jenkins* (T.M. 9940), New Denmark, *Burt-Davy* 999, (D. 9685); Benoni district, Benoni, *Bradfield* 296 (N.H.); Johannesburg district, Frankenwald, *Burt-Davy* 2577 (N.H.), Modderfontein, *Haagner* (G.); Ventersdorp district, Goedgedacht, *Stutton* 596 (N.H.).

The following are cultivated specimens belonging to this species :—

Cape Province : Somerset East district, Somerset East, cult. c. s. m. Transgariepiniis, *MacOwan* (G.); Queenstown district, Queenstown, plant collected at Boksburg, flowered in Botanical Gardens, *Galpin* 7370 (N.H.).

Galpin 12989 cited above, exhibits the phenomenon of having two lateral leaflets attached on the same side of the petiole.

7. **E. Crista-galli** Linn. Mant. I. 99 (1767).

E. fasciculata Benth. in *Linnaea* XXII. 517 (1849).

E. laurifolia Jacq. Obs. Bot. iii 1 (1768).

A shrub or tree, 1–6 m. high. *Stem* woody, sometimes robust, somewhat prickly; branches woody, leafy, armed with prickles, bright green, glabrous; the stronger branches continue perennially but the flowering shoots are annual. *Leaves* scattered along the branches, with the midribs of the leaflets sometimes armed with one or two recurved prickles beneath, armed and unarmed leaflets occurring on the same plant, glabrous; petiole slender, 8–12 cm. long, terete, with or without recurved prickles, glabrous; terminal leaflet 7–10 cm. long, 3–6 cm. broad, ovate or broadly or narrowly elliptic, obtuse to acute; petiolule of terminal leaflet 2·5–3·5 cm. long, sometimes with one or two prickles; lateral leaflets 6·5–9·5 cm. long, 2·5–5 cm. broad, ovate or broadly or narrowly elliptic, obtuse to acute. *Stipules* 0·8 cm. long, narrowly lanceolate, glabrous, deciduous. *Racemes* lateral, very laxly many-flowered, 11–30 cm. long, occurring on the upper portions of the foliage shoots. *Flowers* scarlet, showy, erect or horizontal, arising in clusters of two or three, appearing with the leaves, sometimes in the axil of a leaf. *Bracts* either wanting or early deciduous; bracteoles linear, glabrous, deciduous. *Pedicel* 2–2·5 cm. long, glabrous. *Calyx-tube* 1·2–1·5 cm. long, 1·2–1·5 cm. diameter above, broadly campanulate, distinctly 2-lipped or subtruncate, widening with age, frequently broader than long, glabrous. *Vexillum* 3–4·4 cm. long, 2·1–2·9 cm. broad across the middle, ovate, obovate, or elliptic, obtuse, sometimes emarginate, with a short basal claw, glabrous; keel 2·4–3·8 cm. long, 0·9 cm. broad across the middle, ovate, sometimes falcate, shortly or not at all narrowed at the base; wings 0·7–1·8 cm. long, 0·3–0·5 cm. broad, ovate or oblong-ovate, scarcely narrowed at the base, shorter than the keel. *Filaments* 2·9–4·7 cm. long, with the vexillary filament free to about the middle of the staminal-tube and the rest free for 0·3 cm. above; anthers 2·5 mm. long. *Ovary* 1·4–2 cm. long, on an extremely long gynophore; style 0·5–1 cm. long, linear, glabrous; stigma small, simple, terminal. *Pods* and seeds not seen.

Natal : Durban district, Durban Botanic Gardens, *Forbes* 876 (D. 36468).

Swaziland : Mbabane district, *Nicholson* (N.H. 23007, 23010).

Transvaal : Pretoria district, Pretoria, *Mogg in Government Herb.* 11612 (N.H. 26305) Pietersburg district, Pietersburg, *Stapleton* (N.H. 23008).

SOUTH AFRICAN RUST FUNGI IV.

By

Ethel M. Doidge.

(Part III of this series appeared in *Bothalia*, Vol. III, Part IV, published April, 1939.)**Caeoma Lichtensteiniae** nov. sp.

Pycnidii subepidermalibus, amphigenis v. petiolicolis, inter aecidiis sparsis, lenticularibus, melleis, 100–125 μ diameter. Aecidiis hypophyllis v. petiolicolis, singulis saepe epiphyllis, in epiphylo maculas fuscas generantibus, praecipue ad nervos evolutis, partibus matricis leniter tumefactis insidentibus et greges irregulares v. elongatos 2–15 mm. longos formantibus, dense confertis, 200–300 μ diameter., pallide aurantiacis, epidermide diu tectis, dein nudis epidermide rupta cinctis. Sporibus variabilis, ovatis, oblongis, subglobosis v. angulatis, dense verrucosis, subhyalinis, 25–32 \times 15–22.5 μ , episporio 2.5–3 μ crasso.

Hab. in foliis petiolisque *Lichtensteiniae* sp., Salisbury, S. Rhodesia, leg. Eyles (1966) 14009.

Puccinia Antirrhini Diet. et Holw.

In Hedwigia 36 (1897) p. 298; Syd. Monogr. Ured. I (1904) p. 245.

Uredo-sori hypophyllous, brown, pulverulent; on the leaves circular to irregular in outline, scattered, in irregular groups, or in circles round primary sori, often becoming confluent, up to 1 mm. diameter; on stems more elongated and often coalescing to form long lines; surrounded by the torn epidermis. Uredospores globose to ellipsoid, yellow brown, briefly and rather closely echinulate, 22–30 \times 21–25 μ , episporio 1.5–2 μ thick, with 2–3 equatorial germ pores.

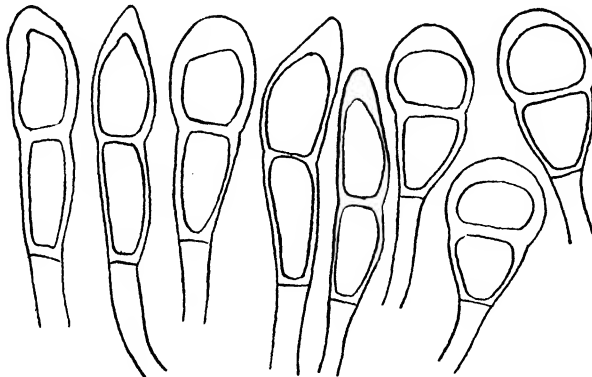


Fig. 1.—*Puccinia Antirrhini* Diet et Holw. Teleutospores, showing 5 spores of the pale, slender form on the left, and three of the darker, broader form.

Teleutosori amphigenous, mostly hypophyllous, on pale or dry indefinite leaf spots, similar to the uredo-sori but darker, pulvinate. Teleutospores calvate or oblong-calvate, of two distinct types. Slender form oblong or oblong-clavate, pale fuscous, 50–70 \times

16-17.5 μ , apex usually more or less acute, rarely somewhat rounded or truncate, strongly thickened up to 12 μ , occasionally 3-celled and up to 75 μ long. Shorter and stouter form clavate, chestnut brown, 32-52.5 \times 17.5-22.5 μ ; apex rounded or truncate, rarely acute, thickened up to 8 μ . Both forms smooth, constricted at the septum, tapering at the base, rarely somewhat rounded at the base, epispore 1-2 μ thick, germ pore in the upper cell apical, obscure in the lower cell, pedicel subhyaline, up to 75 μ long, rarely up to 125 μ long, ca 7.5 μ thick. Both forms are to be found in the same sorus.

on leaves and stems of *Antirrhinum majus* L., Westville, Durban, McClean, 30869; Port Elizabeth, Lust, 30816; East London, Wilson Thompson, 30865; Kidd's Beach, East London, Venables, 30866; Kirkwood, Hess, 30867; Grahamstown, N. J. G. Smith, 30868.

The *Antirrhinum* rust was not recorded as occurring in South Africa until September, 1939, when it occurred in epiphytotic form in the coast districts of Natal and the eastern Cape. The outbreak was recorded by Miss A. M. Bottomley in the public press at the end of 1940.

***Puccinia Junci-oxycarpi* n. nom.**

Syn. *Puccinia Junci* (Strauss) Wint. var. *africana* Doidge in *Bothalia* II (1927), p. 116, on *Juncus oxycarpus* E. Mey., Hennops River, Doidge, 2039.

European material of *Puccinia Junci* is now available for comparison. (Sydow. Uredineen 2169, 2469 on *Juncus Gerrardus*). The European rust, *Puccinia Junci*, according to Sydow (Monogr. Ured. I, p. 643) occurs only in the coastal region of the Baltic and the North Sea. It has larger sori than the South African rust on *Juncus Oxycarpus* and the teleutospores are different. The South African rust has very minute sori and shorter teleutospores with apex usually rounded and less thickened than in *P. Junci*; mesospores are abundant. It also differs widely from other species of *Puccinia* on *Juncus* spp. described from Europe and North Africa.

I consider that the South African rust on *Juncus oxycarpus* should be regarded as a distinct species.

***Puccinia Kuhnii* (Krug.) Butl.**

Ann. Myc. 12 (1914), pp. 81-82, fig. 4; Syd., Monogr. Ured. 4 (1924), p. 608.

Syn. *Uromyces Kuhnii* W. Krug., Bericht der Versuchs-Station für Zuckerrohr in West Java, Kagok-Tegal Heft I, Dresden (1890), p. 120; N. A. Cobb, Agric. Gazette of N.S. Wales (1893), p. 799.

Uredo Kuhnii Wakker et Went., De Ziekten van het suikerriet op Java, Leiden (1898), p. 144.

Uredo-sori hypophyllous, very rarely epiphyllous, on indefinite, elongated, pale yellow to purplish red leaf spots, arranged in series, oblong to linear, 0.5 to 1 mm. long, often becoming confluent and forming longer lines, partially veiled by the epidermis which ruptures early and exposes the powdery spore masses. Paraphyses fairly numerous, peripheral, clavate or cylindrical, straight or curved, sub-hyaline to brown with a wall 1-2 μ thick. Uredospores very variable in form and size, mostly ovate to pyriform, less frequently sub-globose, pale yellow to light chestnut brown, 25-42 \times 17-25 μ ; epispore remotely echinulate, 1.5-2.5 μ thick, either of equal thickness throughout or thickened, at the apex up to 5 μ ; germ pores 4, equatorial.

Teleuto-sori hypophyllous, black, small, linear, or teleutospores developing in the uredo-sori. Teleutospores oblong to clavate, rounded or somewhat flattened at the apex, attenuate at the base, not constricted at the septum or very slightly so, pale yellow (mature 25-40 \times 10-18 μ ; pedicel short, hyaline. Paraphyses similar to those in the uredo-sori,

on leaves of *Saccharum spontaneum* L., Mount Edgecombe, Natal, McMartin, 30752.

This rust is not known as a disease of sugar cane in Natal, and has only recently been observed by Dr. McMartin on a variety of *Saccharum spontaneum* from Turkestan. Sydow (l.c.) points out that there are two forms of uredo-spores, which may occur in the same or in separate sori, one with epispore of even thickness, and one thickened at the apex. The uredo-spore with thickened apex was apparently taken by Kruger for the teleutospore of a *Uromyces*, and the rust described as *Uromyces Kuhnii* Krug. Wakker and Went pointed out that this was only a uredo-form, and the sugar cane rust was for many years known as *Uredo Kuhnii* Wakker et Went.

Teleutospores are rarely found, and are absent from the South African material. *Puccinia Kuhnii* is known in the uredo-stage in Java, India, Japan, Australia, Ceylon and the Philippines, occurring on *Saccharum officinarum* and several wild *Saccharum* spp.; but the teleuto-stage has only been recorded by Butler (l.c.) on *Saccharum spontaneum* collected in Burma.

Cobb illustrates 2-celled paraphyses, which have not been observed in the South African material; Butler thinks it possible, however, that the 2-celled body figured by Cobb was an immature teleuto-spore.

***Puccinia McCleanii* nov. sp.**

Soris teleutosporiferis amphigenis, sparsis v. aggregatis, rotundatis v. oblongis plerumque transversalibus, minutis, usque 0.5 mm. longis, saepe nervis foliis limitatis atro-brunneis, mox nudis, pulverulentis, epidermide fissa cinctis v. semi-velatis. Teleutosporis oblongo-clavatis v. oblongis, apice plerumque rotundatis, saepe truncatis v. conico-angustatis, saepe oblique attenuatis, medio leniter constrictis, basi attenuatis, dilute flavo-brunneis, levibus, $35-62.5 \times 12.5-20 \mu$, plerumque $50-56 \times 14-16 \mu$, episporio 1-1.5 crasso, apice leniter incrassato usque 4μ ; pedicello persistenti brunneo, usque 45μ longo Paraphysibus nullis.

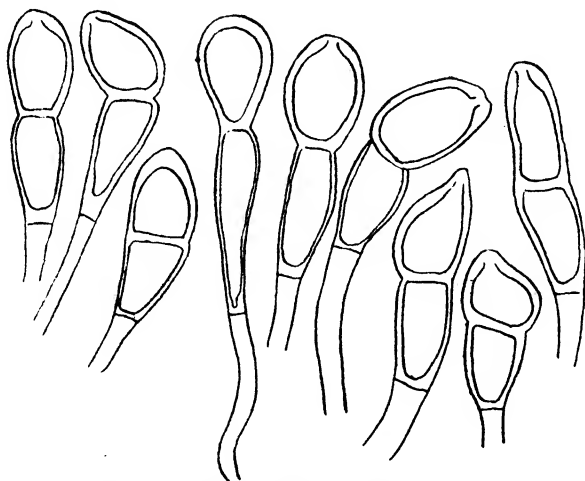


Fig. 2.—*Puccinia McCleanii* Doidge. Teleutospores.

Hab. in foliis *Gladioli Ludwigi* Poppe, Nottingham Road, leg. McClean, 30996.

This species differs in several respects from *P. Gladioli* Cast., which is recorded from the Mediterranean region. The teleutospore are more slender and lighter in colour, pale yellow brown; the lower cell paler, thinner-walled and concolorous with the pedicel. The apex is only slightly thickened, and is traversed by a conspicuous germ pore. There are no paraphyses. The teleutospores of *Puccinia Gladioli* are illustrated for comparison.

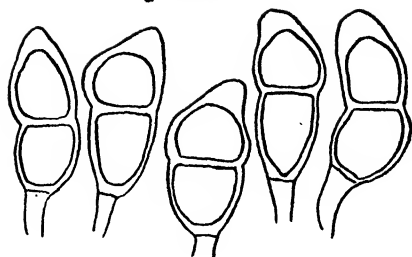


Fig. 3.—*Puccinia Gladioli* Cast. Teleutospores.

Puccinia Gladioli has not been recorded from South Africa, and there appears to be no record of its causing serious damage to cultivated varieties of *Gladiolus*. The "rust" which was first reported in commercial plantings of *Gladiolus* in Natal in 1929 and on several more recent occasions, mostly from the coast districts of Natal and the eastern Cape, is *Uromyces transversalis*. This species which is common on indigenous *gladiolus* spp., caused serious damage in commercial plantings of *Gladiolus* in the eastern Cape, Natal and the Transvaal during the seasons 1937–1938 and 1938–1939 when the rainfall was exceptionally heavy.

In Bothalia II (1927), p. 107, a species of *Puccinia* was described as *Puccinia Gladioli-crassifolii*. Unfortunately the host had been wrongly identified, and the material is too fragmentary for accurate diagnosis; the plant is definitely not a *Gladiolus* sp., but is probably a member of the family Iridaceae. It may be possible to collect this rust again and to identify the host correctly.

***Sphaerophragmium Artabotrydis* nov. sp.**

Soris teleutosporiferis hypophyllis, maculis orbicularibus brunneis v. astro-brunneis, usque 2 mm. diameter indeterminatis insidentibus, sparsis v. subgregariis, 0.5–1.5 mm., rarius usque 2 mm. diameter, rotundatis v. irregularibus, obscure brunneis v. atris, mox nudis en pulberulentis, epidermide fissa cinctis. Teleutosporis lateraliter appianatis ambitu suborbicularibus, ad septa constrictis, ex cellulis 4 (rarissime 3) compositis, brunneis, 30–35 μ v. usque 40 μ diameter, superficie appendiculis fuscis v. brunneolis ad apicem minute stellatim lobatis quasi glochidiatis, rarius simplicibus acutis leniter dilatatis v. uncinatis, 4–6 μ raro usque 10 μ longis laxe et irregulariter obsitis; cellulis singulis equalibus, episporio ca 1.5 μ crasso; pedicello hyalino, crasso persistenti, usque 90 μ longo, 7–10 μ crasso.

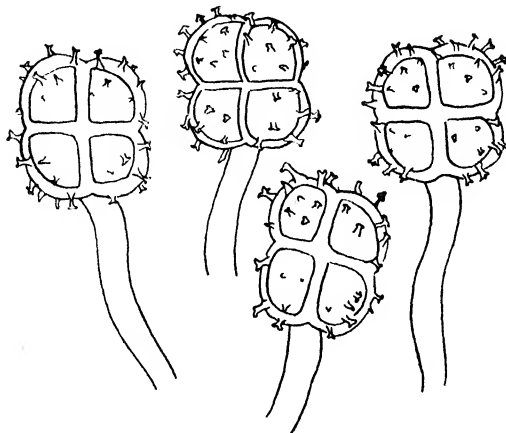


Fig. 4.—*Sphaerophragmium Artabotrydis* Doidge. Teleutospores.

Hab. in foliis *Artabotrydis Monteiroae* Oliv., Westville, Durban, leg. Howlett, 30761.

The teleutospores are very consistently 4-celled, the cross walls being at right angles to one another and the cells equal in size and similar in form. The surface view of the spore is a circle with flattened sides, the diameter along the cross walls measuring 30–35 μ and diagonally between them about 40 μ . The lateral view resembles the teleutospore of a *Puccinia* 30–35 μ long and ca 20 μ broad. There is apparently one germ pore at the apex of each cell.

This species differs widely from *Sphaerophragmium Chevalieri* Har. et Pat. (Buletto Myc. Fr. XXV (1909), p. 109) which occurs on Anonaceae in West Africa. The teleuto spores of this species consist of 5–8 cells irregular in form and arrangement.

Uredo Scirpi-maritimi nov. sp.

Soris amphigenis plerumque hypophyllis, maculis atrobrunneis insidentibus, sparsis v. laxe seriatim dispositis, usque 1 mm. longis, dilute brunneis, diu epidermide infata tectis. Sporis ellipsoideis v. ovatis, aureo-brunneis, dense minuteque verruculosi, 27·5–37·5 \times 15–22·5 μ ; episporio 2–2·5 μ crasso, poris germinationis 2–3 equatorialibus conspicuis praeditis.

Hab. in foliis *Scirpi maritimi* L., Uitenhage, leg. Zeyher (4422) 30904.

This rust was found on Zeyher's specimen in the phanerogamic herbarium; I am indebted to Dr. Dyer for pointing it out to me. It differs from *Uredo Scirpi-corymbosi* in the narrower, thicker-walled, verruculose uredospores. It approaches more nearly to the description of the Australian rust *Uredo Scirpi-nodosi* McAlp. I have not seen this species.

Uredo Cassiae-mimosoidis nov. sp.

Soris amphigenis, sparsis v. gregariis, rotundatis v. ellipticis, 0·5–0·75 mm. longis saepe confluyendo irregularibus, ferrugineis, pustuliformibus, diu epidermide pallida tectis, dein ea fissa cinctis v. semi-velatis, pulverulentis. Sporis ovatis, ellipsoideis, subglobosis v. irregularibus, 21–27·5 \times 16–21 μ , densiuscule breviterque echinulatis, flavidis, episporio 1·75–2·5 μ crasso, poris germinationis 2–4, plerumque 3, equatorialibus conspicuis praeditis.

Hab. in foliis *Cassiae mimosoidis* L., Donkerpoort, Pretoria dist., leg. Doidge et Bottomley 29741.

Uredo Psoraleae-polystictae nov. sp.

Soris hypophyllis, sine maculis, sparsis v. laxe gregariis, rotundatis v. irregularibus minutis, ca 0·25 mm. diameter vel in nervis ellipticis usque 0·5 mm. longis, mox nudis, epidermide fissa cinctis, pulverulentis, ferrugineis. Sporis subglobosis, ovatis v. late ellipsoideis, tenuiter echinulatis, aureo-brunneis, 24–32·5 \times 20–22·5 μ ; episporio 2–3 μ crasso, poris germinationis 3 distinctis equatorialibus vel fere equatorialibus praeditis.

Hab. in foliis *Psoraleae polystictae* Benth., Durban, leg. McClean, 300994.

Uromyces Dolicholi Arth.

in Bull. Torrey Bot. Club 33 (1906), p. 27 and in Mycologia 7 (1915), p. 186.

Syn. *Uredo Dolichi* Arth. Bull. Torrey Bot. Club 33 (1906), p. 513.

Uredo pamparum Speg. in Anal. Soc. Cientif. Argent. IX (1880), p. 173; Syd. Monogr. Ured. IV (1924), p. 585.

Uredo-sori amphigenous but mostly hypophyllous, scattered or crowded, minute, round to irregular, 0·3–0·5 mm. diameter; the epidermis ruptures at an early stage and exposes the cinnamon brown, pulverulent spore masses, which are surrounded by the torn fragments of the epidermis. Uredospores globose or subglobose, briefly echinulate, brown, 18–24 μ diameter, episporio about 1·5 μ thick, with 2–4, usually 3, equatorial germ pores.

[Teleuto-sori similar to the uredo-sori. Teleutospores oblong fusiform or clavulate, tapering to both ends, slightly thickened at the apex ($3-6\ \mu$) smooth, pale yellow or very light brown, $25-38 \times 8-15\ \mu$; epispore very thin, about $1\ \mu$; pedicel delicate, hyaline or subhyaline, up to $40\ \mu$ long.]

on leaves of *Cajanus Cajan* (L) Druce (= *Cajanus indicus* Spreng.) Winkle Spruit, *Pole Evans*, 1594, 1919.

Only uredo-sori are to be found on the South African material and according to Arthur (loc. cit.) all the early West Indian collections on this host show uredinia only. The South African specimens agree well with material collected in Domenico. (Ciferri-, Mycoflora Domingensis exsiccata n. 4). The description of the teleuto-sori is quoted from Sydow's *Monograph Ured.* II., p. 96. According to Arthur (Mycologia loc. cit.) it is probable that *Uredo Cajani* Syd. is also identical with the above species.

Uromyces Drimiopsidis nov. sp.

Sub *Uromyces Erythronii* v. *Drimiopsidis* nom. nud. in Herb. Kew.

Soris uredosporiferis amphigenis plerumque hypophyllis, sparsis v. laxe gregariis interdum subcircinatis, minutis, rotundatis v. oblongis, usque 1 mm. longis, epidermid diu tectis, dein ea fissa cinctis v. semi-velatis, pulverulentis, pallide cinnamomeo-brunneis. Uredosporis sobglobosis ovatis v. ellipsoideis, echinulatis, $20-25 \times 15-19\ \mu$; episporio $15-2\ \mu$ crasso. poris germinationis obscuris.

Soris teleutosporiferis conformis, obscure brunneis. Teleutosporis plerumque ellipsoideis, rarius ovatis v. subglobosis, pallide flavo-brunneis, $27.5-42.5 \times 15-22\ \mu$; apice rotundatis, incrassatione papilliformi dilutior usque $8\ \mu$ alta et lata praeditis, lineis subrectis vel undulatis et subinde anastomosantibus obsitis; episporio $1-1.5\ \mu$ crasso, pedicello hyalino brevi.

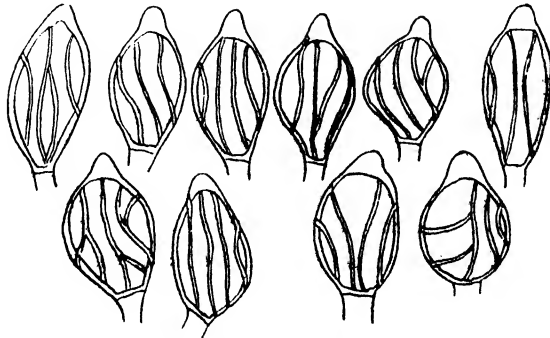


Fig. 5.—*Uromyces Drimiopsidis* Doidge. Teleutospores.

Hab. in foliis *Drimiopsis maculatae* Lindl., Botanical Gardens, Durban, leg. Medley Wood (688) 11125.

The label on the specimens in Kew Herbarium is apparently in Cooke's handwriting, but no author's name for *Uromyces Erythronii* var. *Drimiopsidis* is given, nor can I find any description of this variety.

The rust described above differs considerably from *Uromyces Erythronii* (DC) Pass. The latter has darker brown, broader and more frequently globose teleutospores with a very small, almost hyaline papilla about $3\ \mu$ and more rarely up to $4\ \mu$ long. The sculpturing of the episporē, which is ornamented with raised longitudinal ridges, is similar. An aecidial form is described for *U. Erythronii* but no uredo-stage.

Uromyces Holubii nov. sp.

sub *Uromyces liliacearum* Ung. in Herb. Kew.

Soris teleutosporiferis hypophyllis maculis fuscis ellipticis insidentibus, in greges ellipticos 9–16 mm. longis et 3–6 mm. latos circinatim dispositis, mediocribus, mox confluentibus, epidermide diu tectis dein ea fissa cinctis v. semivelatis, pulvinatis v. sub-pulverulentis, brunneis. Teleutosporis castaneo-brunneis, quoad formam variabilis, globosis, late ellipsoideis v. ovatis, saepe irregularibus, apice rotundatis non incrassatis, basi rotundatis, levibus, $42\text{--}52\cdot5 \times 32\cdot5\text{--}40\ \mu$ vel ca. $45\ \mu$ diameter, episporio crasso, $7\cdot5\text{--}10\ \mu$ pedicello hyalino apice brunneo, persistenti, usque $25\ \mu$ longo, $5\text{--}7\cdot5\ \mu$ lato.

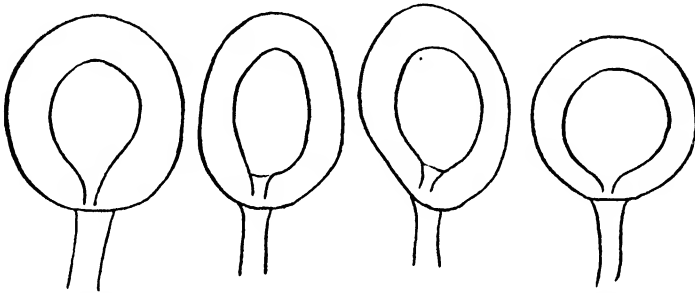


Fig. 6.—*Uromyces Holubii* Doidge. Teleutospores.

Hab. in foliis Liliaceae indet (*Dracaenae* sp.) Lishumo Valley, Zambesi, leg. Holub ex herb M. C. Cooke.

This rust somewhat resembles *Uromyces prupureus* Lgh., described on an undetermined Liliaceous plant from Angola, but differs in having larger spores and thicker episporē. It differs in many respects from *Uromyces liliacearum* Ung.

The type specimen is in Kew herbarium; a small fragment of the type is filed at Pretoria. (Cryptogamic herb. no. 30887).

***Uromyces Setariae-italicae* (Diet.) Yoshino**

in Bot. Mag. Tokyo 20 (1906), p. 247; Syd. Monogr. Ured. II (1910) 339–340, Pl. XIII, fig. 171.

Uredo-sori amphigenous but mostly hypophyllous, scattered or seriate in longitudinal rows, minute, oblong, up to $0\cdot5$ mm. long, surrounded by the torn epidermis, pulverulent, cinnamon brown. Uredospores globose, sub-globose or ovate, finely and rather sparsely echinulate, yellow-brown, $22\text{--}34 \times 18\text{--}26\ \mu$; episporē about $1\cdot5\ \mu$ thick and with 3–4 equatorial germ pores.

[Teleuto-sori mostly hypophyllous, scattered or in groups, minute, round or oblong, long covered by the epidermis, inconspicuous, greyish black. Teleutospores globose, ovate or oblong, often angular, rounded or truncate at the apex, not thickened or only very slightly so, smooth, yellow or yellow-brown, $20\text{--}30 \times 16\text{--}24\ \mu$; episporē $2\text{--}3\ \mu$ thick; pedicel hyaline or subhyaline, about equal to the spore in length.]

on leaves of *Setaria pallidifusca* Stapf et Hubb., Tweedie, Mogg, 11648 ; Nottingham Road McClean, 31003.

on *Setaria verticillata* Beauv., Groenkloof, Pretoria, Pole Evans, 9050 ; Muden, Doidge, 23212.

This species has been recorded on *Setaria glauca*, *S. intermedia*, *S. italica* with its variety *germanica*, *S. verticillata* and *S. viridis* from Japan and East India. The uredo-stage of the South African collections agrees exactly with the specimens from Poona (Sydow, Uredineen 2148-2149) on *S. italica* and from the Philippines (Fungi Malayana Baker No. 296). The latter specimen is labelled *Uromyces Setariae-italicae* (Diet.) Yoshino but no teleuto-spores can be found on the material. According to Sydow (loc. cit.) this fungus is usually found in the uredoform and the teleuto-stage is comparatively rare. Only the uredo has been found in South Africa ; the description of the teleutostage is quoted from Sydow's Monograph.

A FUNGUS OF THE FAMILY ENTOMOPHTHORACEAE FOUND ON SUGAR ANTS (*CAMPANOTUS* SP.).

By E. E. Schaefer.

INTRODUCTION.

During the early months of 1939 when prolonged and soaking rains fell in Pretoria, Transvaal, several "Sugar Ants"—*Campanotus* sp.—were seen at the Division of Botany and Plant Pathology running around with short and white furry growths on their abdomens. Closer examination showed that the growths were of a fungoid nature, and that they apparently protruded from the soft membranes between the abdominal segments. Their nature and position gave the abdomens the distinct ringed or banded appearance characteristic of insects attacked by species of the *Entomophthoraceae*. Search under stones and logs later revealed a fairly large number of the same species of ants, both living and dead, with their entire abdomens covered with much more conspicuous white fungous growths, which fastened them to the ground and stones, etc. These growths varied from loose, cottony masses of long white strands on some insects (Plate I) to compact and more or less solid creamy masses on others (Plate II). This variation was obviously dependent not only on the age of the growths, but also to a large extent on the dampness of the spots in which the insects were found. Although the growths varied in size, in no case were they ever seen extending beyond the abdomen or growing on any other parts of the insect's body. When the covering stones and logs were removed, many of the live ants on taking fright, were able to extricate their abdomens from the enclosing loose cottony growths, which were then left behind as hollow masses. In the structure of these a suggestion at least, of the bands or rings could still be seen. This characteristic appearance was also present and usually more obvious, in the denser growths from which the abdomens of the dead ants had been extracted. The insects which were able to free themselves were, except for a slight sluggishness, apparently normal in all respects.

When examined under a microscope the growths were seen to consist of masses of large-globose fungous spores, and what appeared to be long collapsed and unbranched mycelial threads. (Plate III, Fig. 1.) The denser creamy masses consisted almost entirely of large spores, whereas in the loose cottony masses there was a fair amount of the apparently collapsed hyphae. The spores were globose, more or less uniform in size, and averaged about 30 μ in diameter. Those from the loose growths had smooth or echinate walls enclosing coarsely granular contents, while those from the denser masses appeared to be more or less similar to resting spores found in the *Entomophthoraceae* in general (Plate III, Fig. 2). Their outer walls, however, had apparently shrunk giving them a wavy outline. Under the microscope the dissected abdomens of the ants were seen to contain a number of pieces of thick coarsely granular and intertwined hyphae (hyphal bodies). These hyphae differed in length, but were more or less uniform in diameter, although a few of the shortest pieces were somewhat thicker and more irregular than the rest.

THE FUNGUS IN CULTURE.

The fungus grew readily on most of the common artificial media used in the laboratory. It grew and sporulated especially well on potato agar to which five per cent. dextrose had been added, and it was therefore from cultures on this medium that most of the following observations were made.

The cultures increased rapidly in size and soon covered the surface of the medium in a 9 cms. petri dish. The rapid increase was due primarily to the fact that the ripe spores were discharged in all directions several centimetres from the sporophores and that they germinated almost immediately. In the beginning the growing colony was circular, and appeared as a small, sodden, translucent, and colourless disc, in which the growing hyphae could be seen radiating from the point of inoculation. As the disc increased in size the central portion partially lost its sodden appearance, and the radiating hyphae were more distinct and appeared to be more numerous towards the circumference of the colony. After about 15 to 20 hours in an incubator at 28°C., sporophores formed in the centre of the colony and their attached spores appeared as a white powder in a small circular patch, which gradually increased in size and density (Plate III, Fig. 3). The spores were very soon discharged from the sporophores and could be seen scattered around the central white patch inside as well as outside the colony. The spores germinated almost immediately and soon gave rise to small daughter colonies (Plate III, Fig. 4). As growth continued, the distinct circular outline of the mother colony, which was about 2.5 centimetres in diameter, was gradually obliterated by the numerous discharged spores and their resultant colonies. As in the mother colony, formation and discharge of spores took place in the smaller colonies, and after about four days all suggestion of individual colonies was lost, and the entire surface of the medium was covered by an even white powdery layer of spores. The spores that were shot against the lid and sides of the petri dish adhered to the glass, which consequently became covered with a fine powder, in which, after germination had taken place, numerous fine hyphal threads could be seen with the naked eye.

At room temperature ($\pm 23^{\circ}\text{C}.$) the spores germinated within an hour or two after they had been placed on the medium: the time taken apparently depended, to some extent at least, on the age of the spores. The number of germ-tubes arising from each spore was usually two or three, although one and four were also fairly common (Plate V, Fig. 1). They arose as blunt and hyaline outpushings from the spore-wall and grew very rapidly. (In some cases they had grown eight to ten times the diameter of the spore two and a half hours after inoculation). The hyphae were thick and more or less uniform in diameter ($\pm 11.5\mu$); their contents were coarsely granular except for small portions of the tips, which remained hyaline throughout their growing period. In the beginning the contents of each spore gradually flowed into its growing germ-tubes until eventually the spore was completely emptied. (Plate V, Fig. 2). The protoplasm continued to flow along the growing hyphae towards the tips and so left the proximal portion of each hypha also empty. A septum then formed immediately behind the advancing protoplasm, thus cutting it off from the emptied portion of the hypha and the emptied spore. The distance at which the first septum was formed varied in the different hyphae. In some it was practically in line with the spore-wall, whereas in others it was some distance away. The protoplasm continued flowing with the growing tip and it was again cut off from the emptied portion of the hyphae by another septum. This process was repeated until eventually each hypha consisted of a series of empty segments with only the distal or growing end containing protoplasm. That actual growth took place could readily be seen by the increase in size of the protoplasm-filled segment. A septum did not arise only behind the protoplasm in the growing hyphal tip; at times several were formed in the hypha that was still completely filled with protoplasm. The protoplasm-filled segments thus formed gradually rounded off at the ends and so became individual short pieces of hyphae, which were capable of independent growth (Plate VII, Fig. 22). Instead of several septa arising in the protoplasm-filled hypha, there were times when only one was formed, in which case a certain amount of protoplasm was cut off from that in the tip, which continued growing in the

normal manner. In this way a segment containing protoplasm was isolated from the growing tip by an ever-increasing number of empty segments. The formation of these isolated and filled segments was commonly repeated a number of times, thus forming a hypha consisting of several protoplasm-filled segments separated by intervening empty segments. The protoplasm did not always flow from the germinating spores and along the hypha as a more or less compact mass. Large irregular spaces were often seen in the contents, giving the hypha the appearance of being only partly filled, and suggesting that all the flowing protoplasm could not keep pace with the growing tip. On the formation of a septum in this partly filled hypha, a segment containing the scattered protoplasm was also isolated from the growing tip by an increasing number of empty segments. The protoplasm in the isolated segment however, usually continued flowing in the direction of the growing tip, and consequently became more compact and accumulated behind the septum. During its flow towards the septum the accumulating protoplasm was successively cut off by septa from the portions of the segment that had become emptied, thus leaving an isolated and protoplasm-filled segment with several very short empty segments immediately behind it (Plate VII, Fig. 20). This process was commonly repeated or more than one septum formed at the same time in the hypha containing the scattered protoplasm, thus eventually giving rise to a hypha consisting of several protoplasm-filled segments separated from one another by a number of very short empty segments. The walls of the emptied spores and the emptied hyphal segments, after remaining in position for some time, usually collapsed gradually and in most cases eventually disappeared altogether.

When the isolated protoplasm-filled hyphal segments were left in the original medium, which had become stale, they did not show any further growth, and remained more or less dormant, but gradually accumulated and assumed various enlarged shapes and often became almost completely round (Plate VI, Fig. 7). After the culture had been growing for several days, i.e. when the surface of the medium had become covered by the large globose spores, the submerged mycelium consisted entirely of these variously shaped pieces of hyphae many of which were still connected by the empty segments. (Although the mycelium grew apparently only below the surface of the medium, a fair amount of collapsed hyphae and a few isolated filled segments could always be seen among the numerous large spores on the surface).

The sporophores, which developed as soon as the mycelium was well established, were more or less similar to the ordinary hyphae, but differed mainly in their aerial habit and their positive photographic reaction (Plate IV, Fig. 2). (Because of this reaction the spores were discharged towards the light and consequently the rate of increase in size of a young culture in the laboratory was not the same in all directions). The tips of the sporophores, unlike those of the growing hyphae, were very blunt and were not hyaline but granular. Although they were usually very short—about two to three times the diameter of the spore—many were seen whose length was eight to ten times the spore diameter.

The protoplasm in the sporophore continued flowing towards the tip, which gradually swelled. After more or less all the protoplasm had entered the swelling tip, the latter was cut off by a septum as a large globose mass—the mother cell in which the large single spore was developed. (The walls of the containing cell and of the spore were in close apposition, but could clearly be seen under high magnification, especially after the spore had been emptied of its contents). The sporophore remained turgid usually with a slight swelling on one side suggesting pressure within, and its tip penetrated a short distance into the spore as a dome-shaped columella. The contents of the spore moved or churned continuously as the protoplasm was entering from the sporophore. This churning movement increased until eventually the protoplasm was in violent commotion. The columella appeared to become slightly flattened suggesting that the pressure within the spore was increasing. It was at this stage that the spore was suddenly discharged from the sporophore as a large spherical body with a prominent hyaline papilla. The maximum distance that the spores

were discharged towards the light was about 35 millimetres. The sporophore remained turgid for a short time after the spore had been discharged, its columella appearing as a slightly swollen tip with or without a minute apiculus at the top. Within a few minutes however, it began to collapse gradually and after about a quarter of an hour appeared as a shrunken and flaccid tube at the end of which the columella was very obvious (Plate V, Fig. 6). After the discharge, traces of a broken membrane could usually be seen around the base of both the columella and the spore papilla. These fragments were obviously derived from the continuous membrane of the sporophore and the mother-cell. Owing to increased pressure in the spore and possibly also in the sporophore, this membrane was eventually ruptured, thus discharging the spore. The force was not always sufficient to free the spore from the sporophore notwithstanding the fact that the surrounding membrane had been ruptured. In this case the spore remained attached by its papilla to the columella as illustrated (Plate V, Fig. 6). At times the surrounding membrane was not ruptured at all in which case the spore remained attached to the shrinking and afterwards flaccid sporophore.

Under favourable conditions the discharged spore germinated almost immediately and a new mycelium was formed. Under conditions which were apparently not so favourable, the spore gave rise directly to a sporophore at the tip of which a secondary spore developed (Plate V, Fig. 4). The latter was commonly discharged in the usual way or else it sometimes gave rise to a tertiary spore, which in its turn was also discharged in the usual way. (Plate V, Fig. 5). At times two secondary spores developed from the same primary spore, and in exceptional cases as many as 16 very small secondary spores were seen still attached to the same primary spore (Plate VI, Fig. 16). In the beginning all the spores were more or less the same size—about $35\ \mu$ in diameter—and all possessed the large papilla. In the older cultures, however, the spores varied from $13\ \mu$ to $56\ \mu$ in diameter and most had lost the papilla. The smaller of these spores were seen developing only as secondary spores and never directly from the mycelium. Besides the big variations in size of the spores in the older cultures, many differed from the rest in having numerous, soft hair-like outgrowths covering the entire surface of the spore (Plate VI, Fig. 17). These spores when placed on fresh medium gave rise to one or more germ-tubes in the usual way. (Plate VI, Fig. 18).

In addition to the above, small almond-shaped spores were occasionally found in the older cultures (Plate VI, Fig. 11). These measured approximately $10\ \mu \times 18\ \mu$ and were never seen arising directly from the mycelium. They were in all cases seen to develop from the very small globose spores (Plate VI, Fig. 12), thus it appears evident that they were born only as tertiary spores. On germination they gave rise to germ-tubes somewhat thinner than the normal. (Plate VII, Figs. 13 and 14).

PATHOGENICITY OF THE FUNGUS.

The attempts to infect the same species of ants from which the original cultures were obtained, were unsuccessful, and in no case did any of the live or dead insects develop the typical growths when placed in a petri dish containing the fungus cultures. The larvae of these ants, however, all died within two days after having been placed on the cultures. They were then seen to be full of short pieces of hyphae of various shapes and sizes (hyphal bodies). (Plate VI, Fig. 8). These hyphal bodies were placed on fresh medium, gave rise to normal mycelium (Plate VI, Fig. 9). Within a few hours after death the fungus grew from the larvae and sporulated on the outside. (Plate IV, Fig. 1). Those that were placed on the medium alone, or on cultures together with the adult insects did not die within the same period.

The fungus also attacked termites. In all 198 of these insects were placed on cultures in nine petri dishes and within two days all were dead. Of the 72 placed on the medium alone only eight died during the same time. Those had been attacked by the fungus were full of hyphal bodies (Plate IV, Fig. 3), and were soon covered by the sporulating fungus.

IDENTITY OF THE FUNGUS.

A fungus practically identical with the above was described by Martin,* who found it in 1923 as a contamination on a plate of nutrient agar inoculated from a piece of very rotten wood. The fungus which was obviously one of the *Entomophthoraceae*, was shown to be a species of *Conidiobolus*, and because of the villose appendages of some of the older spores, was named *Conidiobolus villosus* n. sp. The fungus here described however, possesses certain characteristics which make its identity with *C. villosus* somewhat doubtful. Among these are its parasitism, and the stage in its life-history where several minute secondary spores arise from a single spore.

In 1933 a fungus very similar to *C. villosus* was isolated by Kevorkian† from living termites, of the genus *Nasutitermes*, which had been placed in damp chambers for observation. On obtaining sub-cultures of Martin's *C. villosus*, Kevorkian found that it was identical with the one isolated from termites: he demonstrated that it could adapt itself to a parasitic habit, especially on termites, and also observed the additional stage consisting of the production of several minute secondary spores arising from a single spore. After further studies Kevorkian felt justified in making the new combination *Entomophthora coronata* (Cost.); in this species he included Martin's *C. villosus*, the fungus which he himself had isolated from termites, an undetermined species of *Conidiobolus* isolated by Derx from an unknown source, and *Delacroixia coronata* (Cost.) Sacc. and Syd.

Notwithstanding the fact that the writer has observed certain additional minor characteristics such as the presence of spores without basal papillae and the small almond-shaped spores, the fungus described in this article must obviously be regarded as a strain of the same species, *Entomophthora coronata* (Cost.) Kev.

* Martin, G. W.—Morphology of *Conidiobolus villosus*. Bot. Gaz. 83: 311-318, pl. 16, 3 fig. 1925.

† Kevorkian, Arthur G.—Studies in the Entomophthoraceae I. Observations on the genus *Conidiobolus*. Journ. Agric. Univ. Puerto Rico. Vol. XXI, No. 2, 191-200, 3 pl. 1937.

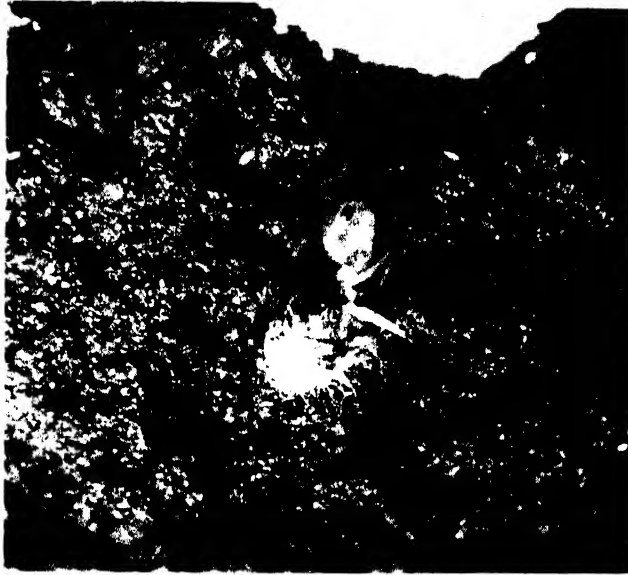


PLATE I.

A sugar ant (*Camponotus* sp.) with its abdomen covered with, and attached to the ground by the loose cottony fungous growth. N.B. The head is blurred on the photograph owing to movement as the ant was still alive.



PLATE II.

A collection of sugar ants showing various stages of the fungous growths.

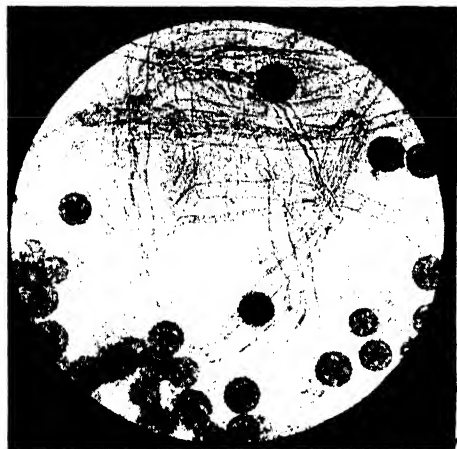


Fig. 1.

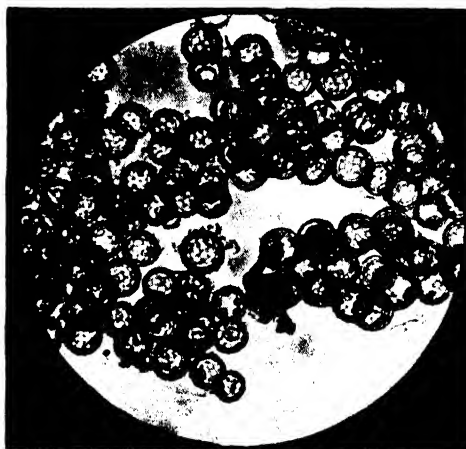


Fig. 2.

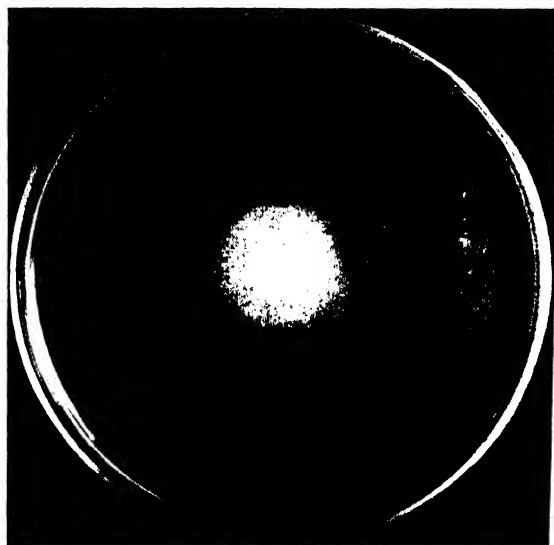


Fig. 3.

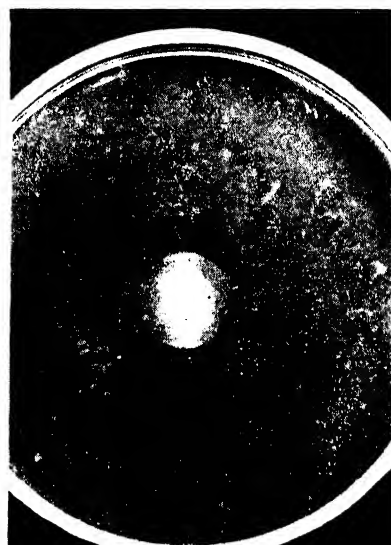


Fig. 4.

PLATE III.

Fig. 1. The loose cottony growth as seen under the microscope.

Fig. 2. The compact growth as seen under the microscope.

Figs. 3 and 4.—Development of the fungous colony on potato + 5 per cent. dextrose agar.



Fig. 1.

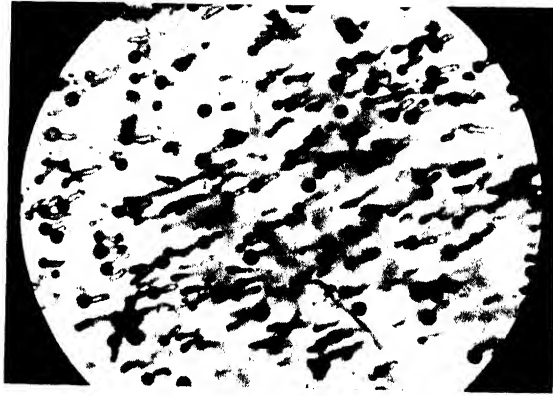


Fig. 2.

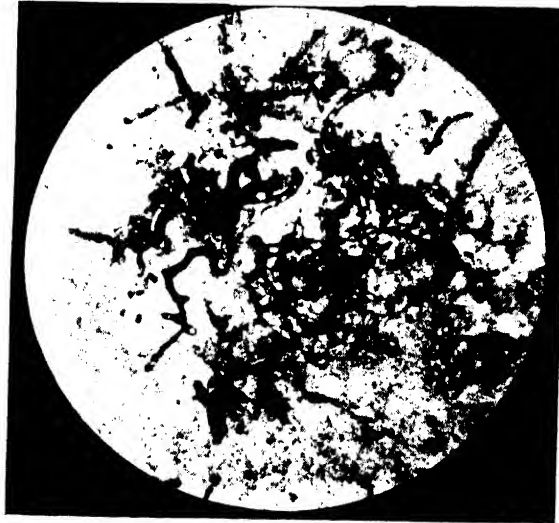


Fig. 3.

PLATE IV.

- Fig. 1.—The fungus sporulating on sugar ant larva.
 Fig. 2.—Sporulating culture as seen under the microscope.
 Fig. 3.—Hyphal bodies from termites.

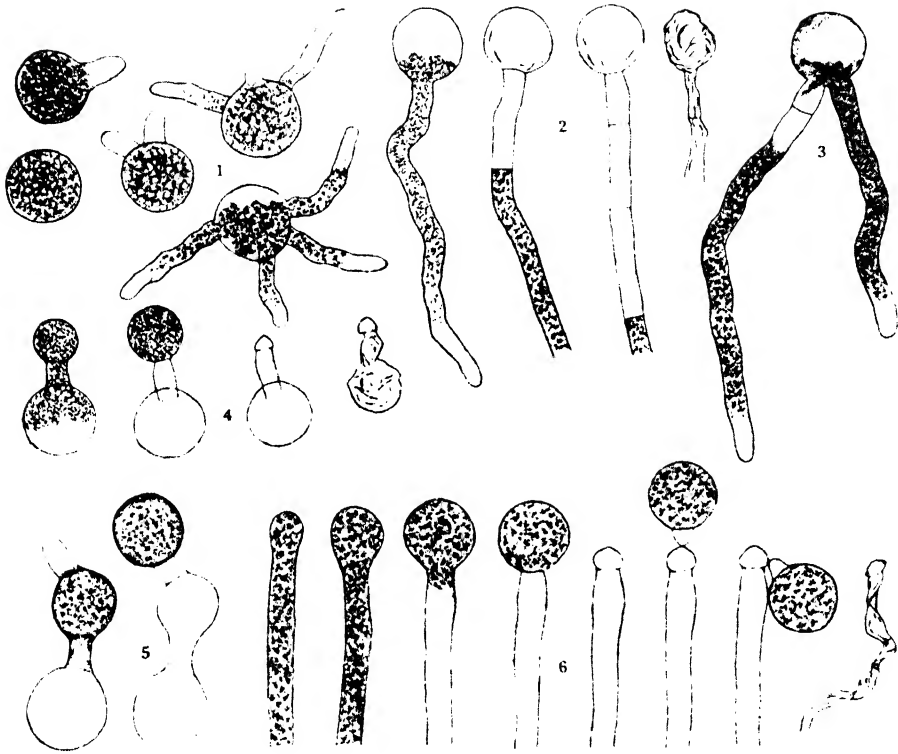


PLATE V (Camera lucida drawings).

- Fig. 1. Spores with 0-4 germ-tubes.
 Fig. 2.—Protoplasm flowing out of spore and along germ-tube; emptied spore and hypha collapsed.
 Fig. 3.—Spore protoplasm cut off by septum from longer germ tube and now flowing into new germ-tube.
 Fig. 4.—Formation and discharge of secondary spore.
 Fig. 5. Formation of tertiary spore.
 Fig. 6. Formation and discharge of spore; collapsed sporophore.

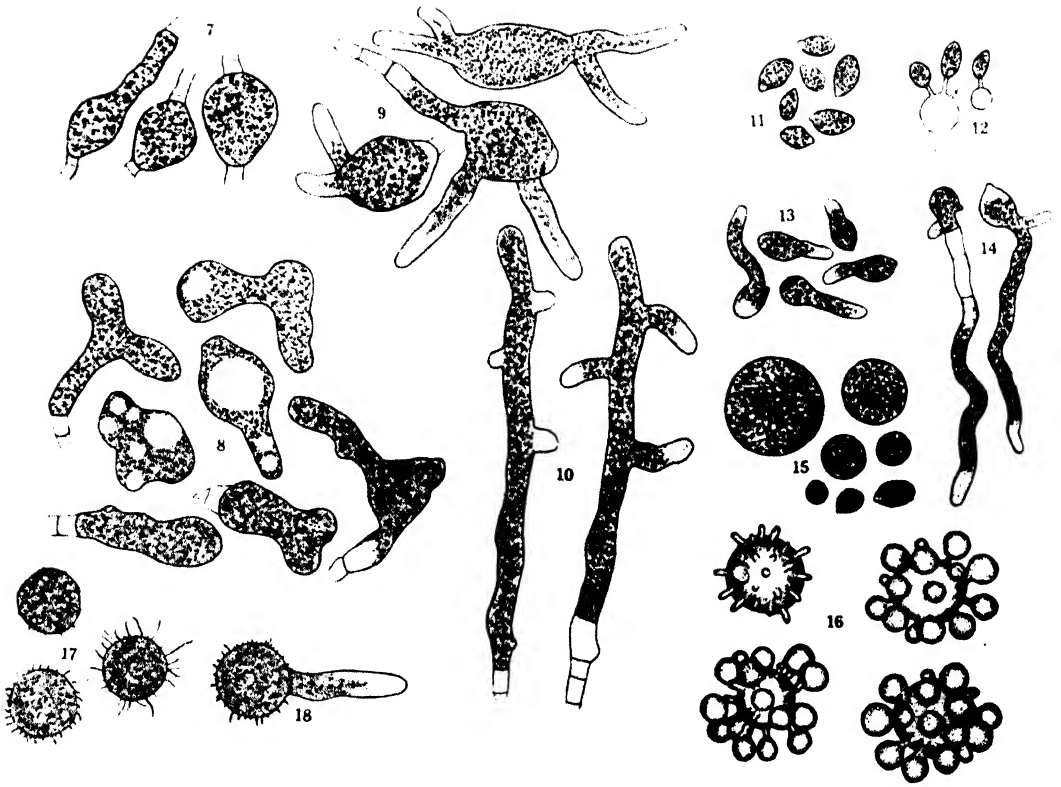


PLATE VI (Camera lucida drawings).

- Fig. 7. —Hyphal bodies from culture 4–10 days old.
 Fig. 8. —Hyphal bodies from ant larva.
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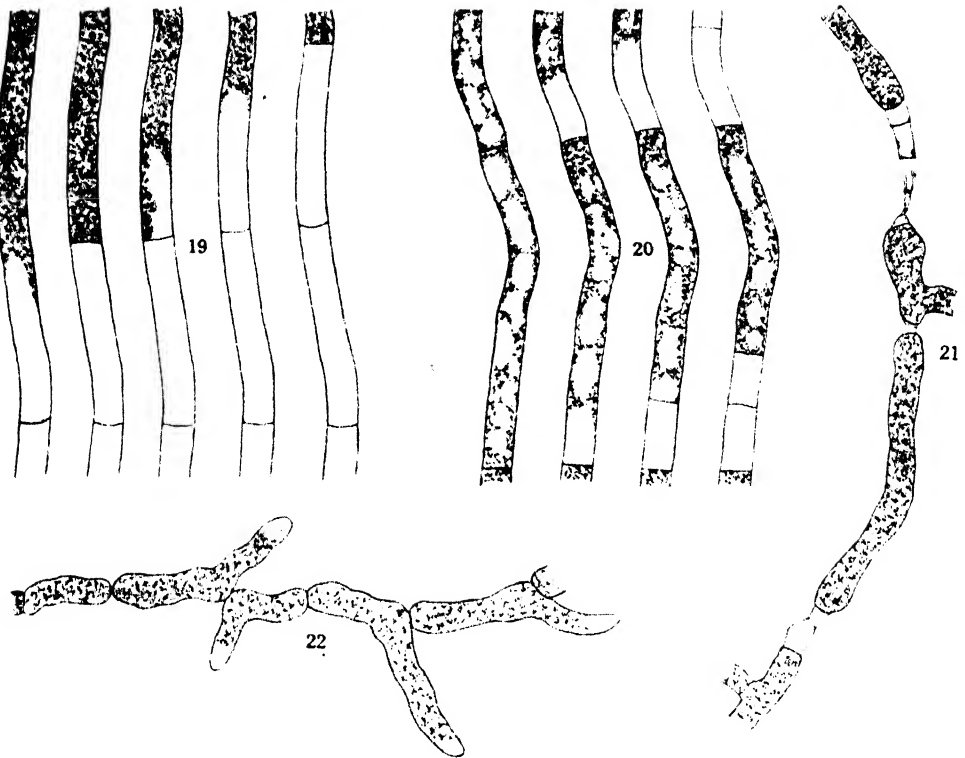


PLATE VII.

Fig. 19. A hypha with flowing protoplasm successively cut off by septa.

Fig. 20. Segment formation in partly filled hypha.

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ol. IV.

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Bothalia

A RECORD OF
CONTRIBUTIONS
FROM THE
NATIONAL HERBARIUM
UNION OF SOUTH AFRICA
PRETORIA



EDITED BY

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SOUTH AFRICAN XYLARIACEAE.

By Julian H. Miller.

There are very few African records of members of this family to be found in early mycological literature. The publication by Cooke and Kalchbrenner (7-8, 12-14) of the Wood collection from Natal and the MacOwan collection from Somerset East, 1879-1882, were among the first. Most of the recent descriptions have been by Lloyd (15-31) and Van der Byl (1-5).

This study was initiated at the request of Dr. E. M. Doidge, Principal Plant Pathologist in the Division of Botany and Plant Pathology in the Department of Agriculture and Forestry, Union of South Africa. The species included in the paper are based on collections that she sent the writer from the Mycological Herbarium at Pretoria and on the South African specimens in Kew Botanical Gardens Herbarium. In all cases references are cited to previous South African literature where such exists.

The writer wishes to express his appreciation to Dr. Doidge for very valuable aid in the study of specimens and the location of South African literature.*

SYSTEMATIC ACCOUNT.

The family *Xylariaceae* includes all fungi whose ascomycete stage is borne in perithecia immersed in a stroma, with definite walls, opening by an ostiole, free paraphyses merging into short paraphyses in the ostiole; with asci lining the wall, cylindrical, short or long stalked, with uniseriate spores; ascospores continuous, elliptical, varying from light to very dark brown with a narrow longitudinal germ pore.

Very small one-celled conidia are borne on short sterigmata of upright branched conidiophores, densely covering the surface of the initial stroma.

The majority of the species are found on woody parts of plants, and only a comparatively small number occur on dung of various animals.

This is a very large family of many variations, and the environmental variants are more noticeable than the genetic. Also, there are few gaps that cannot be bridged by many intermediates. For example, in most species of *Hypoxylon* the perithecia may be free of stroma as in *Rosellinia* or completely immersed in a flat stroma with no visible projections, and may vary in colour from bright red to brown or black, all depending on humidity during growth stage and characters of the substrate. The recognition of species then can be accomplished only by coupling many field studies with descriptions in the literature.

Most of the species are widely distributed over the world, but many follow thermal zones. *Hypoxylon multifforme* and *H. fuscum* are apparently confined to the northern hemisphere, and the bright red series, *H. hypomiltum* and *H. haematostroma*, to the tropics, while *H. rubiginosum* is found on every continent and in every country.

KEY TO THE GENERA.

Xylariaceae.†

- | | |
|--|---------------------------|
| A.—Perithecia single in a superficial stroma..... | 1. <i>Rosellinia</i> . |
| B.—Perithecia several to many in the stroma. | |
| (a) Perithecia seated in base of stroma, with more or less elongated necks, monostichous or polystichous; disc cupulate or effuso-convex, carbonous to woody-leathery..... | 2. <i>Nummularia</i> . |
| (b) Perithecia always monostichous, seated in periphery of stroma. | |
| 1. Stroma semi-globose to pulvinate, applanate to convex, discrete or effused, not definitely stalked. | |
| x. Stroma dark inside. | |
| o. Interior concentrically zoned..... | 3. <i>Daldinia</i> . |
| oo. Interior not zoned, concolorous. Perithecia globoid to angular-elongate..... | 4. <i>Hypoxylon</i> . |
| xx. Stroma bright coloured to white inside as in <i>Xylaria</i> | 5. <i>Penzigia</i> . |
| 2. Stroma broadly clavate to filiform or capitate, simple or branched, definitely stalked. | |
| x. Fertile stroma capitate, forming an expanded disc in which the perithecia are uniformly distributed. | |
| o. Caespitose, forming a crust on wood..... | 6. <i>Kretzschmaria</i> . |
| oo. Not caespitose, on dung..... | 7. <i>Poronia</i> . |
| xx. Fertile region clavate or filiform..... | 8. <i>Xylaria</i> . |

* Deur die goedgegustigheid van die trustees van die Van der Byl Herbarium en van die Stellenbosse Universiteitsraad is 'n geleentheid aan Dr. Doidge vir die bestudering van hierdie groep swamme aan-gebied, wat in die versamelings van wyle Dr. van der Byl te vinde is. Verwysing na hierdie monsters sal in verband met die verskillende soorte gevind word.

† The above list of genera includes only those involved in this study.

DALDINIA Ces. & De Not.

Schema Sferiac. in Comm. Critt. Ital. 1; 197. 1863.

1. **Daldinia concentrica** (Bolt. ex Fr.) Ces. & De Not.
Comm. Critt. Ital. 1: 198. 1863.

Sphaeria concentrica Bolt., Fung. Halif. append. p. 180, tab. 180. 1791.

Valsa tuberosa Scop., Flor. Carniol. 2nd ed. p. 399. 1772.

Sphaeria tunicata Tode, Fung. Meckl. Sel. II p. 59, tab. 17, f. 130. 1791.

Sphaeria fraxinea With., Arrang. Brit. Pl. 3rd ed. t. 4, p. 393. 1796.

Sphaeria concentrica Fr., Syst. Myc. II p. 331. 1823.

Hypoxylon concentricum Grev., Scot. Crypt. Flora, VI, tab. 324. 1828.

Hypoxylon concentricum Fr., Summ. Veg. Scand. p. 384. 1849.

Stroma hemispherical to globose, sessile with wide base to contracted below and plainly stipitate, 2-6 cm. in diameter and 1-3 cm. thick, solitary or coalescing; young stroma rubiginous, erumpent from bark or superficial on decorticated wood, growing into one or more vertical stromata; entostroma conspicuously zonate, fibrous-woody, dark brown with zones broad, 1-2 mm. wide, 10-16 in stroma; ectostroma dark reddish purple, thin; perithecia monostichous, ostiole umbilicate or slightly papillate in old specimens; asci cylindric, 70-115 \times 8-12 μ (p. sp.) with long stalk; paraphysate; ascospores 12-17 \times 6-9 μ ; conidia ovate with greenish tint, continuous, 6-8 \times 4-5 μ .

The writer (33) has described the English specimens and Hopkins (11), Lloyd (15, 16, 18, 22, 26) and van der Byl (3, 5) have noted this fungus from South Africa. Kalchbrenner (12) cited it under *Hypoxylon concentricum*.

Material Examined.

On *Acacia decurrens*, Cramond, Natal, *Pole Evans*, 1335.

Celastrus peduncularis, Deepwalls, Knysna, *J. Phillips*, 18042.

Olea foveolata, Gxoqxowe Forest, Transkei, *District Forest Officer*, 9136.

On dead wood or branches of trees undet., Boschberg, Somerset East, *MacOwan* 1081, 22048 and Herb. Kew; Northern Transvaal, *Doidge*, 1712; and *Wager*, 23231; near Mont-aux-Sources, *Doidge*, 23396; Fish Hoek, Cape, *Stephens*, 24836; Xumeni Forest, near Donnybrook, Natal, *Morgan* and *Doidge*, 30265.

2. **Daldinia Eschscholzii** (Ehr. ex Fr.) Rehm.

Ann. Myc. 2; 175. 1904.

Sphaeria Eschscholzii Ehr., Fung. Cham. 59, pl. 18, f. 8. 1820.

Sphaeria concentrica Fr. b. *Eschscholzii* Ehr. ex Fr., Syst. Myc. 2: 331. 1823.

Daldinia vernicosa f. *microspora* Starb., Kongl. Svensk. vet. Acad. Handl. III. 279: 6. 1901.

Stroma hemispherical to semiglobose, sessile to substipitate, solitary or coalescing, smooth or wrinkled when collected immature, 1.5-5 cm. diameter and 1-4 cm. thick; entostroma conspicuously zonate, soft but persistent, with zones less than 1 mm. wide, and 15-26 in stroma; ectostroma thin, carbonous, reddish-brown to black with age, smooth from inconspicuous, umbilicate ostiola; perithecia monostichous, oblong-angular from compression; asci cylindrical; ascospores uniseriate, inequilaterally ellipsoid, light brown to very dark, 8-14 \times 3-6 μ .

On deciduous wood, common in tropics or subtropics.

The best specimen in the Pretoria Herbarium is No. 11013. This one has spores 8-10 \times 3-4 μ , and very close rings. The wrinkled surface is due to drying out before maturity has been reached and is not a specific character.

Material Examined.

On *Celtis rhamnifolia*, Lusikisiki, Cape, *District Forest Officer*, 6927.

Croton sp. Komatipoort, *Pole Evans*, 11013.

Heteromorpha trifoliata, Potchefstroom, *J. Phillips*, 30717.

On rotten wood, Knysna, *van der Byl* 1336.

HYPOXYLON Bull.

ex Fr. Summa Veg. Scand. p. 383. 1849.

KEY TO THE SPECIES.

- A.—Ostiola in centre of truncate discs.
1. Disc minute, less than $100\ \mu$ in diameter.
 - (a) Ascospores $5-7 \times 2.5-3\ \mu$ 1. *H. Stygium*.
 2. Disc more than $100\ \mu$ in diameter.
 - (a) Ascospores $9 \times 3\ \mu$ 2. *H. truncatum*.
 - (b) Ascospores $17-22 \times 4-6\ \mu$ 3. *H. Gilletianum*.
- B.—Ostiolar disc not present.
1. Stroma rarely showing perithecial projections, black, carbonous, applanate to convex.
 - (a) Surface coarsely papillate from projecting ostiolar. Ascospores $15-23 \times 6-8\ \mu$ 4. *H. mediterraneum*.
 - (b) Surface finely papillate to almost smooth. Ascospores $11-16 \times 5-8\ \mu$ 5. *H. exutans*.
 2. Stroma indefinite in form, perithecial projections usually evident.
 - (a) Ostiolar papillate, ectostroma dark at maturity.
 - x. Initial stroma dirty-white, at maturity thick, easily separating from substrate. Perithecia large, ascospores $28-34 \times 7-10\ \mu$ 6. *H. deustum*.
 - xx. Initial stroma bright red. Perithecia small, ascospores $8-11 \times 4-5\ \mu$ 7. *H. glomeratum*.
- C.—Ostiola umbilicate, not projecting beyond ectostroma.
1. Stroma 4-10 mm. thick, hemispheric to applanate, with trace of 1 or 2 zones, some shade of red to dark purple-brown. Ascospores $12-17 \times 6-7\ \mu$ 8. *H. sclerophaeum*.
 2. Stroma not thick as above, some shade of red.
 - (a) Blood-red particles conspicuous in ectostroma between perithecia.
 - x. Ascospores $8-11 \times 5-6.5\ \mu$ 9. *H. hypomiltum*.
 - xx. Ascospores $14-18 \times 7-9\ \mu$ 10. *H. haematostoma*.
 - (b) Ectostroma not as above. Ascospores $9-12 \times 4-5\ \mu$ 11. *H. rubiginosum*.

1. *Hypoxyton Stygium* (Lév.) Sacc.

Syll. Fung. 1 : 379. 1882.

Sphaeria Stygia Lév., Ann. Sci. Mat. 5 : 258. 1846.*Hypoxyton puiggarii* Speg., Bol. Acad. Cient. Cordoba 11, no. 257. 1889.*H. annuliforme* Rehm., Verh. bot. Ver. Brand. p. 65. 1890.*H. platystomum* Ell. & Ev., N. Am. Pyren. p. 649. 1892.*H. microcarpum* Penz. & Sacc., Malpighia 11 : 492. 1897.*H. bogoriense* v. Höhn., Sitzb. K. Akad. d. Wiss. Wien, 118, abt. I, p. 341. 1909.*H. punctatum* Petch, Ann. Roy. Bot. Gard. Perideniya 8 : 153. 1924.

Stroma pulvinate or effused, originating as a very thin reddish-brown layer under moist conditions, or a reddish slate colour if exposed, gradually darkening until at maturity it is shining black, hard and carbonous, smooth with perithecia immersed or almost free. Perithecia very small, the vertices growing through the ectostroma to form a ring in the centre of which is the small, conical ostiolum; asci cylindrical, paraphysate, $46-55 \times 4-5\ \mu$, short-stalked; ascospores uniseriate, oblong to navicular, at maturity dark brown, $5-7 \times 2.5-3\ \mu$.

Common on deciduous wood throughout the tropics and subtropics.

This species has the smallest perithecia and spores in the annulate group. The perithecia may be completely immersed as in *H. exutans*, or almost as free as in a *Rosellinia*. The smaller spores and initial red stroma instead of green, distinguish it from *H. truncatum*.

Not previously noted from South Africa. The writer (34, 38) has described it from South America.

Material Examined.

On wood, Town Bush Valley, Pietermaritzburg, Rump 106, 27760.

African Specimens in Kew Herbarium.

As *H. annulatum*, Uganda, Small 63, Maitland 315; Kisubi Forest, Uganda, Maitland 521.

As *H. marginatum*, Congo, Vanderyst 4170.

As *H. microcarpum*, Uganda, Maitland 126.

As *H. annuliforme* Rehm. n. sp., in Museum botanicum Berolense, Africa.

2. *Hypoxylon truncatum* (Schw. ex Fr.) Mill.

Trans. Brit. Myc. Soc. 17: 130. 1932.

Sphaeria truncata Schw., Syn. Car. no. 174. 1822.

Sphaeria truncata Fr., Syst. Myc. 2: 442. 1823.

Sphaeria annulata Schw., Jour. Acad. Nat. Sci., Phila. 5: 11. 1825.

Sphaeria annulata v. *depressa* Fr., Elench. Fung. 2: 64. 1828.

Sphaeria marginata Schw., Trans. Amer. Phil. Soc. II, 4: 190. 1832.

Sphaeria truncatula Schw., loc. cit. p. 210.

Hypoxylon annulatum Mont., C. Gay, Hist. Chile Bot. 7: 445. 1850 (Excl. spec.).

Hypoxylon marginatum Berk., Outl. Brit. Fungol. p. 387. 1860.

Rosellinia nitens Ces., Note Bot. p. 13. 1872.

Hypoxylon chalyboeum Berk. & Br., Jour. Linn. Soc. 14: 121. 1875.

Hypoxylon glomiforme Berk. & Curt., Grevillea 4: 49. 1875.

Hypoxylon Murraini Berk. & Curt., Grevillea 4: 49. 1875.

Stroma pulvinate or effused, at first green, later brown and at maturity shining black and carbonous, indefinite in shape, varying from hemispheric, 2–3 mm. in diameter and 1–2 mm. thick, to appanate and indefinitely effused, with immersed or almost free perithecia; perithecia globose to oblong, projecting through ectostroma to form an annulate disc around each papillate ostium; asci cylindrical, $75\text{--}110 \times 6\text{--}7 \mu$, with attenuated stalk, paraphysate; ascospores uniseriate, oblong-navicular, light brown to dark, $7\text{--}9 \times 3\text{--}5 \mu$, chiefly $9 \times 3 \mu$.

On deciduous wood in tropics and semitropics.

Most mycologists have followed Ellis and Everhardt in placing the forms with projecting perithecia under *H. annulatum*, and those with sunken ones under *H. marginatum*. These, however, are environmental forms of the same species.

The writer (39) has added to the list of synonyms, Cheesman (6) and van der Byl (5) have described it from South Africa and Lloyd (18) determines the No. 31372 below as *H. fuscum*.

Material Examined.

On bark and on rotting wood, Knysna, Bottomley, 30745, van der Byl 1340 and 2756; Forest Hall, Knysna, Duthie 148, 31372 (in van der Byl Herb. under *H. fuscum*); Xumeni Forest, nr. Donnybrook, Doidge, 32148; (as *Hypoxylon annulatum*) South Africa without locality, van der Byl 2238, 2247, Herb. Kew.

3. *Hypoxylon Gilletianum* Sacc.

Ann. Myc. 4: 76. 1906.

Hypoxylon africanum van der Byl, S. Afr. Jour. Sci. 25: 185. 1928, and Ann. Univ. Stell. 10: 6. 1932.

Stroma hemispheric, .5–1 cm. in diameter and 1–3 mm. thick, isolated to confluent in masses, 2 cm. in diameter, black and shining hard carbonous ectostroma and woody black entostroma; perithecia globose, .5–.6 mm. in diameter, with papillate ostiola in centre of annulate depression; asci cylindric, $85\text{--}120 \times 4\text{--}6 \mu$, with tapering stipe, paraphysate; ascospores elongate, inequilaterally ellipsoid, brown, $17\text{--}22 \times 4\text{--}6 \mu$.

This species is very close to *H. malleolus* in spore shape and size, but differs in the smaller stroma. The American species is often nearly globose and 1–2 cm. in diameter, resembling a *Daldinia*.

The Saccardo type is from Kisantu, Congo, and apparently the species is confined to Africa. Lloyd (25) determined No. 31409 as *H. multifforme*.

Material Examined.

On bark or wood, Krantzklouf, Natal, Doidge, 9104; Umgeni Bush, Durban, Rump 365c, 30173 and Rump 379b, 30185; Forest Hall, Knysna, Duthie 221, 31409.

As *H. malleolus* var., Uganda, Mailland 76 and 130, Herb. Kew.

As *H. malleolus* forma, Tiko, Cameroon, Dr. Dunlap 61, Herb. Kew.

As *H. africanum* L., on dead stump, Durban, van der Byl 598.

4. *Hypoxylon mediterraneum* (De Not.) Mill.

Mycologia 33: 75. 1941.

? *Sphaeria clypeus* Schw., Syn. Car. no. 42. 1822.

Sphaeria mediterranea De Not., Microm. Ital. dec. 6, p. 96. 1851.

Hypoxyylon regium De Not., Sphaer, Ital cent. 1, fasc. 1, no. 12, p. 15. 1863.

Hypoxyylon repandoides Fekl., Symp. Mycol. Jahrb. Nassau Ver. Natur. 23 : 236. 1869.

Diatrype clypeus Berk., Grev. 4 : 95. 1876. Non Schw.

Nummularia repandoides Sacc., Syll. Fung. 1 : 397. 1882.

Nummularia australis Cke., Grev. 11 : 148. 1883.

Nummularia clypeus Cke., Grev. 12 : 6. 1883. Non Schw.

Nummularia mediterranea Sacc., Syll. Fung. 1 : 400. 1882.

Nummularia regia Sacc., Syll. Fung. 1 : 400. 1882.

Stroma appanate to convex, 1-1.5 mm. thick, indefinitely effused; ectostroma very hard carbonous, black; entostroma black and woody, surface smooth except for coarsely papillate ostiolaria; perithecia in periphery, globose to oblong-angular from crowding; asci cylindrical, $97-116 \times 9-12 \mu$, with short stalk and surrounded by rather broad paraphyses; ascospores elliptical, brown, $15-23 \times 6-8 \mu$.

On wood, apparently more common in America than in either Europe or Africa.

This species is often confused with the European *Hypoxyylon nummularium* Bull. ex Fr. (*Numm. Bulliardii* Tul.) but can easily be distinguished by the more coarsely papillate ostiolaria and larger spores. The ascospores of the latter are more broadly elliptic and $9-14 \times 7-9 \mu$. Van der Byl (5) describes this under *H. clypeus*.

Material Examined.

On *Quercus* sp., Stellenbosch, van der Byl 1303, as *H. clypeus*. *Salix* sp., on dry wood, Lady Grey, R. Nel (van der Byl 1727) as *H. clypeus*; on stump, Dordrecht (van der Byl 2449) as *H. clypeus*.

On wood, South Nigeria, Farquharson 36, Herb. Kew, as *Nummularia* sp.

5. *Hypoxyylon exutans* Cke.

Grevillea 8 : 66. 1879.

Diatrype exutans Cke., Ann. N.Y. Acad. Sci. 1 : 185. 1879.

Anthostoma exutans Sacc., Syll. Fung. 1 : 296. 1882.

Nummularia exutans Cke., Grev. 12 : 8. 1882.

Stroma appanate to convex, orbicular to indefinitely effused, black inside and outside, ectostroma hard, carbonous, surface smooth with indistinct ostiolaria to slightly papillate, thin, 1-1.5 mm. thick; perithecia closely packed in periphery, .4-.6 mm. diam.; asci cylindrical, short stipitate, $95-120 \times 8-11 \mu$, paraphyses broad; ascospores oblong-elliptic, brown to almost black, $11-16 \times 5-8 \mu$.

Common on wood in tropics and subtropics.

This species differs from *H. mediterraneum* in possession of smaller spores and more finely papillate ostiolaria and from *H. nummularium* in larger, more elongate spores. This fungus thus lies just between these two species.

The writer (38) has described it from Venezuela, and Kalchbrenner (12) from South Africa.

Material Examined.

On *Acacia mollissima*, Town Bush Valley, Pietermaritzburg, Rump 119, 27765.

On wood, Bazuja, Kaffraria, Baur 704, Herb. Kew (as *Hypoxyylon exutans*, cited by Kalchbrenner); Xumeni Forest, near Donnybrook, Morgan and Doidge, 27725; Knysna, van der Byl 713 and 2233 (as *H. punctulatum* and *Nummularia punctulatum*).

6. *Hypoxyylon deustum* (Hoffm. ex Fr.) Grev.

Scot. Crypt. Fl. 6 : tab. 324, fig. 2. 1828.

Sphaeria maxima Hall., Hist. Stirp. Helv. 3 : 122. 1768.

Sphaeria deusta Hoffm., Veg. Crypt. 1 : 3, tab. 1, fig. 2. 1787.

Sphaeria versipellis Tode, Fung. Meckl. Sel. fas. 2 : 55, tab. 17, fig. 129. 1791.

Hypoxyylon ustulatum Bull., Champ. Fr. 1 : 176. t. 487, fig. 1. 1791.

Sphaeria deusta Hoffm. ex. Fr., Syst. Myc. 2 : 345. 1823.

Hypoxyylon ustulatum Bull. ex. Fr., Summa Veg. Scand. p. 383. 1849.

Ustulina vulgaris Tul., Sel. Fung. Carp. 2 : 23, tab. 3, figs. 1-6. 1863.

Ustulina deusta Hoffm. ex. Petrak, Ann. Myc. 19 : 279. 1921.

Stroma indefinite, on rough substratum variously distorted, irregularly effused, following the inequalities of the bark, undulate repand to subpulvinate, 1.5-3 mm. thick; on smooth wood appanate, subzonate and much thinner; the young stroma greyish white, fleshy

leathery, becoming carbonous and black with age, the mature stroma easily separating along the line of the perithecial bases; perithecia very large with papillate ostiolar necks, far apart; asci cylindrical and tapering, $190-260 \times 10-15 \mu$, p. sp., stalk $50-60 \mu$ in length; ascospores elliptical to inequilateral, opaque at maturity, $28-34 \times 7-10 \mu$; paraphyses filiform branched; conidia hyaline, smooth, narrowly ovate, $5-6.5 \times 2-3 \mu$.

On wood, usually old stumps near ground line, common in every country.

The writer (33) and also van der Byl (5) retain this form in the genus *Hypoxylon*. This species approaches *Hypoxylon serpens*, but differs in larger spores and having the perithecia less closely packed in the stroma so that the ostiola are farther apart in the ectostroma.

Material Examined.

On wood, usually old logs and stumps, Kromrivier, Rustenburg Distr., Doidge and Bottomley, 32146; Eshowe, van der Byl 494, 501, 691, 704; Stella Bush, Durban, van der Byl 1065; Woodbush, N. Transvaal, van der Byl 1486.

7. *Hypoxylon glomeratum* Cke.

Grev. 11: 134. 1883.

H. mascariensis Berk. ex Cke., Grev. 11: 131. 1883. Non Mont.

H. anthracoderma Speg., Fung. Guar. Puig. 3: 28. 1888.

H. Berkeleyi Sacc., Syll. Fung. 9: 551. 1891.

H. Bakeri Earle, Torr. Bot. Club Bull. 26: 633. 1899.

H. vinosa-purpureum Ell. & Ev., Fl. Lud. Nom. nud.

H. cohaerens Pers. ex Fr. var. *brasiliensis* Starb., Ascom. Reg. Exped. 2: 8. 1901.

H. rubigineo-areolatum Rehm, var. *microspora* Theiss., Ann. Myc. 6: 345. 1908.

H. Merrillii Syd., Ann. Myc. 15: 212. 1917.

H. cupricolor Petch, Ann. Roy. Bot. Gard. Peradeniya 8: 158. 1924.

H. rubigineo-areolatum Rehm var. *Bakeri* (Earle) Mill., Mycol. Explor. of Colombia. Jour. Dept. Agric. P.R. 14: 273. 1930.

Stroma indefinitely effused, applanate to convex to pulvinate, when in small glomerules 1-2 mm. thick; perithecia globose to angular, completely immersed or often completely separated, ectostroma at first bright red, varying to reddish brown with age, and finally at maturity dark purplish brown with small, black, papillate ostiola; asci cylindrical, $50-68 \mu$ p. sp., plus $40-60 \mu$ long stripes; paraphyses; ascospores uniseriate, inequilaterally ellipsoid, brown, $8-11 \times 4-5 \mu$.

Common the world over. The writer has seen specimens from Canada to the Argentine and from Africa and Asia, but not from Europe.

A reddish brown specimen can be distinguished from *H. rubiginosum* by the papillate ostiola, and later dark stages from *H. multiforme* by the much smaller perithecia, and from *H. serpens* by the spores of the latter being larger, $12-15 \mu$ in length.

No. 27682 is exactly like Cooke's type, while in No. 29821 the perithecia are almost free as is the type of *H. Bakeri*. These are environmental differences.

Material Examined.

On wood, Town Bush Valley, Pietermaritzburg, Rump, 27682, and Rump 105, 27794; Xumeni Forest, near Donnybrook, Morgan and Doidge, 28935 and 29821.

8. *Hypoxylon sclerophaeum* Berk. & Curt.

Exot. Fung. Schw. Jour. Acad. Nat. Sci. Phila. 2nd ser. 2: 285. 1853.

? *Sphaeria coelata* Fr., Linnaea 5: 540. 1830.

? *H. suborbicularis* Welw. & Curr. Fung. Angol., Trans. Linn. Soc. 26: 281. tab. 17. 1868.

H. placentiforme Berk. & Curt., Jour. Linn. Soc. 10: 383. 1869.

H. Wrightii Berk. & Curt., l. c. 1869.

H. coelatum Ces., Fung. Born. Atta Acc. Sci. fisich e. matim. di Napoli 8: 19. 1879.

Nummularia suborbicularis Sacc., Syll. Fung. 1: 399. 1882.

N. suborbicularis Sacc. v. *Cookeanum* Sacc., l. c.

N. Wrightii Sacc., Syll. Fung. 1: 398. 1882.

N. placentiformis Sacc., Syll. Fung. 1: 399. 1882.

N. nicaraguerense Ell. & Ev., Ia, Univ. Bull. 2: 394-415. 1893.

Penzigia polyporus Starb. Aacom. der Schwed. Chaco-Cordill. Exp. p. 32. Ark. für Bot. 5. 1905.

Daldinia placentiformis (B. & C.) Theiss., Ann. Myc. 7 : 4. 1909.

N. Cookeana (Sacc.) Rehm., Ascom. Phil. Leaff. Bot. 6 : 2273. 1914.

Pyrenopolyporus Hunteri Lloyd, Myc. Writ. 5 : 706. f. 1054. 1919.

H. amorphum Ell. & Ev. Nom. nud. Kew Herb.

Hypodiscus placentiformis (B. & C.) Rick., Broteria ser. Bot. 25 : 34. 1931.

Stroma hemispheric, suborbicular, $2-3 \times 1.5-2$ cm. and $1-1.5$ cm. thick, or indefinitely effused, often 15-20 cm. in length and 1 cm. thick; ectostroma smooth reddish-purple, varying to dark brown in age, entostroma shiny black to brown with one or two very faint zones; perithecia semiglobose to elongate-compressed in periphery of stroma, ostioli indistinct to umbilicate; asci cylindrical, $60-75 \mu$ long p. sp. plus stipe $50-60 \mu$ in length; paraphysate; ascospores elliptic-oblong, brown, $12-17 \times 6-7 \mu$.

Cosmopolitan in tropics and subtropics.

This species is intermediate between *Daldinia* and *Hypoxydon*. The texture of the stroma and occasional faint zones remind one of the former, but the shape, usually almost flat, is definitely that of the *Hypoxydon* concept.

The writer (38) describes this species and gives a list of synonyms. The variety *Cookeana* is this form, but the species is probably something else. The type of the latter, *Welwitsch* no. 137, in woods between Monimo and Ivantala, Huilla, has been lost from Kew.

Material Examined.

As *H. suborbiculare* var. *Cookeanum* Sacc., South Nigeria, *Farquaharson* 61. Herb. Kew.
Pyrenopolyporus Hunteri Lloyd, Ashanti, Coomasse, *T. Hunter*, Kew.

9. *Hypoxydon hypomiltum* Mont.

Ann. Sci. Nat. 2nd ser. 13 : 356. 1840.

H. subgilvum Berk. & Br., Ceylon Fungi, Jour. Linn. Soc. 14 : 120. 1875.

H. Fendleri Berk. ex Cke., Grev. 11 : 132. 1883.

Stroma convex-applanate, semiorbicular, with completely immersed perithecia, or pulvinate with almost free ones, 1-2 mm. thick or indefinitely effused and much thinner; ectostroma bright red with deep blood-red particles, with smooth surface with umbilicate ostioli, with entostroma below the red layer, dark brown; asci cylindrical, $55-70 \mu$ p. sp., with stipe $50-60 \mu$ long; paraphysate; ascospores elliptic-navicular, $8-11 \times 5-6.5 \mu$.

Common in the tropics over the world.

This species and *H. haematostroma* when developed under the optimum conditions are brilliant red, but vary from this colour to brown or even black with lack of humidity or with age. The blood-red particles are, however, always noticeable in the ectostroma and will separate them from *H. rubiginosum*. These forms have no definite shape except as determined by the substrate. The writer (37) has previously described the differences between members of the red series.

Cooke (8) named No. 10390, *H. rubiginosum*.

Material Examined.

On wood, Inanda, Natal, *Medley Wood* 523, 10390 and Herb. Kew; Winter's Kloof, Natal, *Rump*, 27532; Caverns, near Mont-aux-Sources, *Bottomley*, 28893; Xumeni Forest, near Donnybrook, *Morgan and Doidge*, 29820; Knysna, Cape, *Bottomley*, 30746.

10. *Hypoxydon haematostroma* Mont.

Sagra, R. de La, Fl. Cuba, p. 344, 1838-1842.

H. vividum B. & Br., Fung. of Ceylon, Jour. Linn. Soc. 14 : 122. 1875.

H. vera-crucis B. & Cke., Grev. 11 : 129. 1883.

H. haematites Lev. ex Cke., Grevillea 11 : 133. 1883.

H. ochraceum P. Henn., Hedwigia 36 : 228. 1897.

H. subrutilum Starb., Ascom. d. I. Rehn. Exped. II. p. 10, fig. 7-8. Bihang. t. K. Svenska Vet. Acad. Handl. bd. 27, afd. III. 1901.

H. St. Janianum Ferd. & Wge., Bot. Tids. 29 : 14. 1908.;

Stroma semiorbicular, or indefinitely effused, or in pulvinate glomerules, 1-2 mm. thick, with ectostroma red with blood-red particles, with lower entostroma black to dark brown; perithecia semiglobose to elongate-compressed in a palisade layer with umbilicate ostioli often inconspicuous; asci cylindrical, $60-75 \mu$ p. sp., and with stipe $40-50 \mu$ in length; paraphysate; ascospores $14-18 \times 7-9 \mu$, brown, inequilaterally elliptic.

Common in tropics over the world.

This has the appearance of a large spored form of *H. hypomiltum*. The two specimens listed below are very meagre and old, but have the internal characters of this species.

Material Examined.

On wood, Knysna, Cape, *Bottomley*, 30748, 31058.

11. *Hypoxylon rubiginosum* Pers. ex. Fr.

Summa Veg. Scand, p. 384. 1849.

Sphaeria rubiginosa Pers., Syn. Meth. F., p. 11. 1801.

Sph. granulosa Pers., Syn. Meth. F., p. 11. 1801.

Sph. perforata Schw., Syn. Car. n. 45. 1822.

Sph. durissima Schw., Syn. Car. n. 46. 1822.

Sph. durissima Schw. ex. Fr., Syst. Myc. 2: 335. 1823.

Sph. rubiginosa Pers. ex Fr., Syst. Myc. 2: 340. 1823.

Sph. fuscopurpurea Schw., Jour. Acad. Nat. Sci. Phila. 5: 16. 1825.

Sph. decorticata Schw., Trans. Amer. Phil. Soc. Phila. n. ser. 4: 191. 1832.

Sph. investiens Schw., l.c., p. 193. 1832.

Sph. xanthostroma Schw., l.c., p. 193. 1832.

Sph. Catalpae Schw., l.c., p. 193. 1832.

Hyp. perforatum Schw. ex Fr., Summ. Veg. Scand. p. 384. 1849.

H. luridum Nits., Pyr. Germ. p. 31. 1867.

H. botrys Nits., Pyr. Germ. p. 34. 1867.

H. Laschii Nits., Pyr. Germ. p. 36. 1867.

H. purpureum Nits., Pyr. Germ. p. 37. 1867.

H. fragile Nits., Pyr. Germ., p. 39. 1867.

H. decorticatum (Schw.) Curt., Geol. & Nat. Hist. Survey, N.C., pt. III, p. 140. 1867.

H. investiens (Schw.) Curt., l.c., p. 140. 1867.

H. fuscopurpureum (Schw.) Curt., l.c., p. 140. 1867.

H. ferrugineum Otth., Mittl. nat. Ges. Bern. p. 41. 1868.

Diatrype cercidicola B. & C. ex Pk., 25th Rep. N.Y. State Mus., p. 101. 1873.

H. anthochroum B. & Br., Jour. Linn. Soc. 14: 122. 1875.

H. trugodes B. & Br., l.c., p. 123. 1875.

H. mercurium B. & Br., l.c., p. 123. 1875.

H. florideum B. & C., Grev. 4: 50. 1875.

H. concurrens B. & C., Grevillea 4: 93. 1876.

H. suborbiculare Pk., 30th Rep. N.Y. State Mus., p. 63. 1878.

Anthostoma cercidicolum (B. & C. ex Pk.) Sacc., Syll. Fung. 1: 306. 1882.

H. durissimum (Schw.) Sacc., Syll. Fung. 1: 378. 1882.

H. Catalpae (Schw.) Sacc., Syll. Fung. 1: 392. 1882.

H. ianthinum Cke., Grev. 11: 132. 1883.

H. piceum Ell., Amer. Nat. 17: 193. 1883.

H. guarapiense Speg., Fung. Guar. Puig. 1: 81. 1886.

H. onnii Karst., Symb. et Myc. Fenn. p. 143. Hedwigia. 1887.

H. subchlorinum Ell. & Calk., Jour. Myc. 4: 86. 1888.

H. subhuteum Ell. & Ev., N. Amer. Pyr. p. 648. 1892.

Nummularia lateritia Ell. & Ev., Proc. Acad. Nat. Sci. Phila., pt. 1, p. 144. 1893.

H. Pilgerianum P. Henn., Hedwigia, p. 136. 1900.

H. subrubiginosum P. Henn. nom. nud. C. F. Baker n. 335.

H. lianincolum Rehm., Ascom. Phil. IV, Leaflet. Phil. Bot. 6: 1944. 1913.

Stroma pulvinate to effused, indefinite in extent, continuous for several centimetres on decorticated wood, or 1-3 mm. thick when erumpent from bark; young stroma fleshy-leathery, at maturity woody, very old specimens crumbling, never carbonous; colour of stroma varying, when young bright brick-red to purplish red to shades of reddish brown, becoming black with extreme age; perithecia variable in size, depending on distance apart in stroma; ostiolar necks umbilicate, often containing a white mycelial growth in ostiolum; asci cylindrical, tapering to a long stalk, $70-80 \times 7 \mu$ p. sp., and $65-80 \mu$ for the stalk; ascospores at maturity dark brown, inequilaterally elliptical, $9-12 \times 5-5 \mu$; conidia minute, elliptical, $4-5 \times 3 \mu$.

No. 28569 is a flat, dark reddish-purple type that one often sees on decorticated wood. This is the most common species anywhere in the world, and therefore has been given more

names than any other species. No. 31069 is parasitised by *Tympanopsis euophala* (B. & C.) Starb., and the writer has collected that combination in Georgia and even in England. The parasite does not attack other species, and so its presence is one point in the diagnosis,

Material Examined.

On *Mimusops Zeyheri*, Boschfontein, near Wolhuter's Kop, Doidge and Bottomley, 31068 and 31069 (the latter No. parasitised by *Tympanopsis euomphala*).

On wood, Town Bush Valley, Pietermaritzburg, Rump 188, 28569; Randfontein Estates, Johannesburg, Lurie, 28746.

Excluded Names.

There are several Hypoxylon names found in the literature of this region that are not included in the systematic account. These are given below with reasons for their exclusion.

1. *Hypoxylon argillaceum* Fr. (non Pers.) MacOwan collection from Somerset East, determined by Kalchbrenner (12). No specimen was found in Kew Herb.
2. *H. colliculosum* Nits., described by Cheesman (6). No specimen was available for study. Also the name is not valid. It is a synonym of *H. serpens*.
3. *H. cornutum* Hoffm., based on Drège No. 9461. No specimen available. Also name not valid. It is a synonym of *X. Hypoxylon*.
4. *H. fuscum* Pers. ex Fr. in Thüm; Fung. Austro-afric., No. 52 and van der Byl (5). Specimens not available. The Lloyd (18) citation was based on a *H. truncatum* specimen.
5. *H. malleolus* B. & R., Hopkins (10, 11). No specimens were seen, but this is probably *H. Gilletianum*.
6. *H. natalense*? Lloyd (29). No specimen available for study.
7. *H. punctilatum* B. & R., van der Byl (5). Specimen studied is *H. exutans*.

KRETZSCHMARIA Fries.

Summa Veg. Scand., p. 509. 1849.

1. **Kretzschmaria cetrarioides** (Curr. & Welw.) Sacc.

Syll. Fung. 2: XXIX. 1883.

Hypoxylon cetrarioides Curr. & Welw., Angol. Fung. p. 282, tab. 18, μ gs. 5-6. Trans. Linn. Soc. 26: 282. 1869.

Sphaeria lichenoides Berk., Kew Herb. Nom. nud.

Rhopalopsis lichenoides (B.) Cke., Grev. 11: 94. 1883.

Rhopalopsis cetrarioides (C. & W.) Cke., Grev. 11: 127. 1883.

Kretzschmaria lichenoides (B.) Sacc., Syll. Fung. 2: Add. ad vol. I, XXIX. 1883.

Kretzschmaria lichenoides Rick., Ann. Myc. 7: 8. 1909.

The stroma consists of a horizontal network of branches with vertical stalks bearing capitate fertile regions as in *Kretz. micropus*. The entire system at maturity becomes a more or less compact crust of free perithecial capitula above a fused mass of coalesced branches. This is indefinitely effused on wood and about 5-10 mm. high. The capitula are 3-6 mm. in diameter, semiglobose with convex surface and constricted under the head, each containing from 10-35 perithecia, with prominent papillate ostiola. The ascospores are $28-32 \times 9-11 \mu$, acutely elliptical and dark brown.

There is a great deal of variation in the shape of the capitula. When closely compacted they are very flat on top and when separated they are more convex.

There is a specimen in Kew Herb. labelled *Sphaeria lichenoides* Berk., Port Natal, which is this species. It has never been formally described. The specimen cited below is old and not typical, and so is placed here with some hesitation.

Material Examined.

As *Sphaeria lichenoides* Berk., Port Natal. Kew Herb.

On wood, Xumeni Forest, near Donnybrook, Morgan and Doidge, 27726.

2. **Kretzschmaria knysnana** van der Byl.

Ann. van die Univ. v. Stellenbosch 10: 5. 1932.

Stromata separate, not united by a basal system, composed of closely packed, irregularly clavate, expanded fertile regions with peripheral perithecia, and attenuated stipes about 1 mm. thick and 5-6 mm. long, with clava 4-10 mm. in diameter. Surface of stroma

scabrous, brownish black, with very small papillate ostiola surrounded by a whitish ring. Perithecia irregularly arranged, 14-80 in each head. Fertile part of stroma solid, white inside, and slightly buff-tinted around perithecia. Ascospores inequilaterally elliptic, $26-33 \times 7.9-9 \mu$.

The writer has not seen a specimen, and has taken the above description from that of van der Byl and notes and illustrations from Dr. Doidge. It very doubtfully belongs in *Kretzschmaria* and appears in no respects different from closely aggregated forms of *Xylaria anisopleura* or other tropical *Xylarias*.

Material Examined.

On rotten wood, "Tuin van Eden", Knysna, van der Byl 2549.

3. *Kretzschmaria micropus* (Fr.) Sacc.

Syll. Fung. 2: Add. XXIX. 1883.

Sphaeria micropus Fr., *Linnaea* 5: 542. 1830.

Hypoxylon micropus (Fr.) Sacc., Syll. Fung. 1: 389. 1882.

Initial stroma consists of a horizontal branching system with upright stalks also bearing short branches, which finally enlarge at the apices into perithecial capitula. The entire mass at maturity develops into a widespread crust of fused branches and closely compact perithecial heads at approximately the same level. The individual branches are about 1-1.5 mm. thick, and are at first tomentose, later becoming glabrous. These give rise to secondary branches, and the whole mass is then about 5-10 mm. in height. The perithecial capitula are subglobose to pyriform, 2.5-3.5 mm. in diameter, at first brown, later black, with surface cracking and scaly, each with 1-5 perithecia with strongly papillate ostiola. The ascospores are inequilaterally elliptical with acute to obtuse ends, $31-35 \times 10-12 \mu$.

Saccardo at first listed it as *Hyp. micropus* (Fr.), but later (Vol. 2: XXIX) has it *Kretz. micropus* (Berk.). The Berkeley citation was a mistake which he acknowledged in Vol. 15.

Petch (41) says this species would appear to be doubtfully distinct from *Kretz. cetrarioides*. The writer feels that while they are similar in possessing the basal horizontal stroma and similar spores they differ in that in *Kretz. cetrarioides* the capitula are larger with an indefinite number of perithecia, and this character seems sufficient to maintain separate species.

Van der Byl (5) describes this species from South Africa.

Material Examined.

On wood, Knysna, van der Byl 2249; Eshowe, Zululand, van der Byl 500.

NUMMULARIA Tul.

Sel. Fung. Carp. 2: 42. 1863.

1. *Nummularia Kalchbrenneri* (Sacc.) Comb. nov.

Hypoxylon placenta Kalch., Grev. 9: 28. 1880. (Non Link & Fr.)

H. Kalchbrenneri Sacc., Syll. Fung. 1: 364. 1882.

N. placenta Cke., Grev. 12: 8. 1883.

N. lepidum Syd., Ann. Myc. 22: 425. 1924.

H. lepidum van der Byl, Ann. Univ. Stell. 10: 7. 1932.

Stroma orbicular, carbonous, 3-4 mm. in diameter, with slightly sunken disc with raised border, with very indistinct ostiola. Perithecia seated in the base of the stroma, flask-shaped with fairly elongate neck. Ascospores dark brown, elliptic-navicular, $9-12 \times 4-5 \mu$.

This is the same type of fungus as the common *N. discreta* on apple in Europe and America. *N. Baileyi* Cke. is a similar form but differs in the larger spores, $14-19 \times 9-11.2 \mu$.

Material Examined.

On wood, Somerset East, MacOwan 1304, 20818. The writer has also seen the type in Kew Herbarium.

On rotten trunk of *Gonioma Kamassi*, Knysna, van der Byl 1341 (Cotype of *N. lepidum* Syd.).

Other *Nummularia* names in South African literature are found in this paper under *Hypoxylon*.

PENZIGIA Sacc.

Myc. Malc. p. 20. 1888.

Emend. Petch, Ann. Roy. Bot. Gard. Perad. 8 : 138-141. 1924.

1. **Penzigia discolor** (B. & Br.) comb. nov.*Hypoxyylon discolor* B. & Br., Ceylon Fungi. Jour. Linn. Soc. 14 : 123. 1875.*H. citrinum* Shear, Survey of P. R., N.Y. Acad. Sci. 8 : 66. 1926.

Stroma pulvinate, convex to irregular by mutual pressure, 1-3 mm. in diameter, .5-1 mm. high, attached to the substrate at a central point. Surface dirty-white, scabrous, later grey and finally black and smooth. Context surrounding perithecia yellow-grumose, lower white and firm; asci cylindrical, p. sp. 65-90 μ with stipe 40-50 μ long; ascospores broadly elliptic, brown, 9-12 \times 6-9 μ .

A similar form that is yellow is *Hypoxyylon quisquiliarum* Mont., but that has much larger spores, - 28-35 \times 14-17 μ . *Penzigia eterio* (B. & Br.) Petch has the same shape as *P. discolor*, but differs in being pinkish-white inside. The specimen cited below is fully equal to the Kew type.

Material Examined.

On dead wood, Xumeni Forest, near Donnybrook, Natal, *Morgan and Doidge*, 31062; Untali, *Eyles 4246* (*van der Byl 2413*), as *Hypoxyylon* sp.

2. **Penzigia verrucosa** sp. nov.

Stroma convexo-rotundatum, ectostroma levi vel undulatum vel mutua pressione deformum, solum vel caespitosum, basi plana vel concava et plicata, centraliter affixa brevi stipite in substrato, 2-10 mm. in diam. et 1.5-5 mm. altum. brunneum vel nigrum, minute granuloso, verrucosum; entostroma album, suberoso, lingnosum; peritheciis monostichis, globosis vel angularibus, .3-.6 mm. in diam., ostiolis emergentibus late papillatis; ascis cylindraceutis, paraphysatis, 8-spores, ascosporis oblongo-navicularibus, diluto-brunneis vel nigris, 30-37 \times 10-12 μ .

Ad ligna.

This species is near *Hypoxyylon verrucosum* Theiss. and *Penzigia sessilis* Theiss. The former is semiglobose instead of flat hemispheric, and is probably the hypoxyloid form of *Xylaria anisopleura* Mont. It differs from *P. sessilis* in the prominent ostiola and verrucose surface. The spores of all three are about the same.

Material Examined.

On fallen log, Woodbush, Northern Transvaal, *Doidge*, 17793, Type.

PORONIA Willd. ex Fr.

Summa Veg. Scand. p. 382. 1849.

1. **Poronia Oedipus** Mont.

Syll. Crypt. p. 209. 1856.

Sphaeria (*Poronia*) *punctata* var. *oedipoda* Mont., Ann. Sci. Nat. 2nd ser. 13 : 333. 1840.

Sphaeria incrassata Jungh., Flor. Javae Crypt. p. 87. 1838.

Hypoxyylon oedipus Mont., Cuban Fl. p. 346, tab. 13, f. 2. 1838-42.

Poronia macropoda v. *cladonioides* Ces., Comm. Critt. 1 : 70. 1861.

Stroma erect, usually simple, with light, greying-brown stalk, 2-4 cm. high and 2-3 mm. thick at the swollen base, abruptly expanded at the apex into a concave then plane disc. The disc is orbicular, 2-3 mm. in diameter, light grey, with prominent black papillate ostiola. Perithecia globose to ovate, entirely sunken in the surface of the disc. Asci cylindrical, short-stipitate, 90-120 \times 18-20 μ ; with uniseriate ascospores broadly elliptical, black, surrounded by a thick hyaline sheath, 28-30 \times 14-16 μ .

Found on animal dung. Kalchbrenner and Cooke (14) and van der Byl (5) cite this species from South Africa.

Material Examined.

On cow dung, Boschberg, near Somerset East, *MacOwan 1300*, Herb. Kew; in Herb. S. African Museum, Cape Town, No. 33866, sub *P. macropus* Kalch.

2. *Poronia punctata* L. ex Fr.

Summa Veg. Scand. p. 382. 1849.

Peziza punctata L., Flor. Suec. Ed. II. p. 458. 1745.*Sphaeria nivea* Haller, Stirp. Helvet. tom. III, p. 121. 1768.*Poronia Gleditschii* Willd., Flor. Berol. Prodr. p. 400. 1787.*Sph. Poronia* Pers., Syn. Meth. F. p. 15. 1801.*Poronia fimetaria* Pers., Champ. Comest. p. 154. 1818.*Sph. punctata* Fr., Syst. Myc. 2: 330. 1823.

Stroma erect, at first clavate, later expanding apically into a flat to cupulate disc, 2–10 mm. in diameter and an attenuated, smooth light brown stipe, 1–2 cm. high; disc white to pale grey and dotted with prominent black ostiola with solid white context. Perithecia sunken in upper surface of disc, with broadly cylindric asci, $120\text{--}160 \times 16\text{--}18 \mu$, with short stipes. Ascospores inequilaterally elliptic, dark brown to black, surrounded by a hyaline sheath, $18\text{--}26 \times 10\text{--}14 \mu$.

This is the type of the genus. The distinctions between this species and the previous one lie chiefly in the spore dimensions and in the stipe characters. In *P. punctata* the stipe is gradually expanded upwards to the disc, while in *P. oedipus* it is enlarged near the base and decreases in diameter upward producing an abrupt contraction under the disc. Also, the stipe in *P. punctata* is immersed in the substrate, while that of *P. oedipus* is usually free from 1–2 cm. Both occur on cow or horse dung and are widely distributed, but *P. oedipus* is more common in the tropics. References are by Cooke (7) and Lloyd (19).

Material Examined.

On horse dung, Inanda, Natal *Medley Wood* 404, 11131 and Herb Kew; Mulder's Vlei Stellenbosch District, *Acocks*, 27663.

On dung, Hondjies Kuil, Barkly West, *Acocks*, 28632.

ROSELLINIA De Not.

Giorn. Bot. Ital. 2: 334. 1847.

1. *Rosellinia aquila* (Fr.) De Not.

Sfer. Ital. p. 21, t. 18. 1863.

Sphaeria bysseda b. Tode, Meckl. Fungi 2: 10. 1791.*Sph. aquila* Fr., Syst. Myc. 2: 442. 1823.

Perithecia superficial, gregarious to closely caespitose, globose, about 1 mm. in diameter, apex rounded, abruptly papillate, carbonous, dark brown to shining black with age, developing in a dense brown subiculum which sometimes persists; asci cylindric with long stipe, p. sp. $165\text{--}195 \times 10\text{--}12 \mu$ with stipe $27\text{--}35 \mu$ in length; ascospores inequilaterally elliptic with acute ends, $25\text{--}30 \times 7\text{--}9 \mu$, brown.

The specimen cited below is typical for the species except for the lack of any subiculum. However, the perithecia are fully mature and this surface mycelium often disappears with age.

Material Examined.

On old stems of *Rubus pinnatus*, Xumeni Forest, near Donnybrook, *Morgan and Doidge*, 31065.

On wood, Knysna, *van der Byl* 2226.

XYLARIA Hill. ex Fr.

Summa Veg. Scand. p. 381. 1849.

KEY TO THE SPECIES.

A.—Fertile clava covered with a pellicle, a layer distinct from the one encasing the perithecia.

1. Apices fertile, containing perithecia.

(a) Pellicle continuous, neither striate nor splitting in lines.

x. Surface white with black ostiola, clava semi-globose to conic ovate, 5–7 mm. in diameter, single or several on short branches coming from apex of long rooting stipe..

Spores $12\text{--}18 \times 6\text{--}10 \mu$ 1. *X. Doumetii*.

- xx. Surface light brown, clubs up to 10 cm. high, clavate-cylindric, hollow at maturity, involute and splitting, perithecia completely immersed.
Spores $18-24 \times 6-8 \mu$ 2. *X. tabacina*.
- xxx. Surface dark brown, glabrous, clubs clavate-cylindric, becoming hollow, perithecial projections evident with prominent papillate ostiola, 2-6 cm. high.
Spores $10 \times 4 \mu$ 3. *X. cubensis*.
- (b) Pellicle splitting in lines.
- x. Stroma cylindric to clavate becoming hollow.
- o. Pellicle light yellowish brown, surface markedly reticulate.
Spores $18-23 \times 6-7 \mu$ 4. *X. reticulata*.
- oo. Pellicle dark brown, surface chiefly marked with longitudinal lines.
Spores $9-11.5 \times 4-6 \mu$ 5. *X. variabilis*.
2. Apices sterile with acutely pointed tips.
- (a) Pellicle splitting in wide anastomosing lines, perithecia in the depressions.
- x. Surface dark umber-brown.
- o. Stroma slender, much branched or simple.
Spores $11-16 \times 5-7 \mu$ 6. *X. arbuscula*.
Spores $9-12 \times 4-5 \mu$ 7. *X. multiplex*.
- B.—No persistent pellicle, surface chiefly white to grey at first, later changing to black with maturity.
1. Apices sterile, pointed.
- (a) Clava cylindrical with attenuated stipe.
- x. Perithecial elevations very prominent.
- o. Stipe stout, short, enlarged purple-pannose at base, clava 2-5 mm. in diameter, compressed or terete with short sterile apex.
Spores $8-10 \times 4-5 \mu$ 8. *X. bulbosus*.
- oo. Stipe and clava slender. On fruits.
- y. Clava 1.5-3 mm. in diameter, pubescent, simple with pointed sterile apex, or occasionally dichotomously branched above, stipe villous, perithecia large, .5-1 mm. in diameter, very prominent at maturity.
Spores $8-11 \times 4-4.5 \mu$ 9. *X. ianthino-velutina*.
- yy. Clava 1.5-2.5 mm. in diameter, glabrous, usually simple with very short sterile apex, perithecia fairly prominent, small .3-.6 mm. in diameter.
Spores $10-12 \times 4-5 \mu$ 10. *X. Oxyacanthae*.
- xx. Perithecial elevations not so prominent.
- o. Clava compressed, 1.5-3 mm. wide, simple or much branched from base or above, apex short pointed, stipe villous. On wood.
Spores $10-14 \times 4-5 \mu$ 11. *X. Hypoxylon*.
- oo. Clava semiglobose with an elongate filiform stipe.
- y. Apices of fertile heads aristate or sharply pointed.
- / On wood or fruit rind.
Spores $14-16 \times 4.5-6 \mu$ 12. *X. heloides*.
Spores $20-28 \times 8 \mu$ 13. *X. schreuderiana*.
- // On leaves.
Spores $10-12 \times 5-6 \mu$ 14. *X. aristata*.
- yy. Apices obtuse.
- / On dung, spores with hyaline sheath.
Spores $40-50 \times 18-23 \mu$ 15. *X. vaporaria*.
2. Apices fertile, obtuse.
- (a) Clava cylindric, 2-4 mm. in diameter, terete, with elongate subterranean stipe and large semiglobose sterile sclerotia, surface brown varying to very dark with age, perithecia small, prominent, ostiola papillate; growing from termite nests.
Spores $4-5 \times 2.5-3 \mu$ 16. *X. nigripes*.
- (b) Clava stout, rounded, with age black, rugose, stipe abbreviated, with varying shapes from hypoxylid to oblong-clavate, single or branched from the base, white inside, solid not becoming hollow, usually with purple pannose base.
Spores $8-10 \times 4 \mu$ 17. *X. castorea*.
Spores $25-33 \times 7-10 \mu$.
Fertile stroma roughened fragariform often hypoxylid.. 18. *X. anisopleura*.
Fertile stroma rugose but not fragariform..... 19. *X. polymorpha*.

1. *Xylaria Doumetii* (Pat.) comb. nov.

Poronia Doumetii Pat., Rev. Myc. p. 136. 1893 and Rev. Myc. 17: tab. 156, figs. 1-2. 1895.

Stroma cylindrical, consisting of a brown, roughened, subterranean stipe, 7-10 cm. long, and 2-4 mm. in diameter, terete, with upper 5-10 mm. above the ground, with single clava or with several short thick branches with fertile apical bulbous enlargements, 5-7 mm. in length and 3-5 mm. in diameter, with white surface, darkening somewhat with age, with white fleshy-leathery interior; perithecia black in entire periphery of clava, with small, black, punctate ostiola; asci cylindrical, p. sp. 103-110 \times 10-11 μ , with brief stipe 18-46 μ in length; paraphysate; ascospores elliptical, brown to black, 12-18 \times 6-10 μ .

On dead roots.

This diagnosis is based on specimens cited below and determined by Lloyd (29) or Miss. E. M. Wakefield. The transfer to *Xylaria* is necessary, because it does not occur on dung, the ascospores do not have the hyaline sheath, and finally the clava is not expanded into a disc as in *Poronia*.

Material Examined.

On soil, Armoedsvlakte, Vryburg, det. Lloyd, 15422; Hondjieskuil, Barkly West, *Acocks*, 28631.

On dead roots on ploughed ground, Kuruman, Cape, *Acocks* (Det. Wakefield), 28630.

2. *Xylaria tabacina* (Kickx.) Berk.

Hook. Jour. Bot. Kew Gard. Misc. 6: 225. 1854.

Hypoxyton tabacina Kickx., Bull. Acad. Brux. 8: 11. 1841.

Stroma simple, cylindrical to clavate with fertile clava, 3-10 cm. high and 4-8 mm. in diameter, terete, then splitting and becoming involute and hollow, with light brown smooth pellicle with very small inconspicuous dark ostiola; with stipe 1-3 cm. in length, smooth, brown; perithecia semiglobose, completely sunken in periphery of stroma; asci cylindrical, p. sp. 100-120 \times 8-11 μ with stipe 35-45 μ long; paraphysate; ascospores inequilaterally elliptic, brown, 18-24 \times 6-8 μ .

There is a good description of this *Xylaria* by van der Byl (2), also Lloyd (21) has cited it from South Africa. No specimens were seen by the writer.

Material in van der Byl's Herbarium.

On *Olea* sp., Knysna, *J. Phillips* (van der Byl 2335), *Podocarpus Thunbergii*, Knysna, *Duthie* (van der Byl 1104).

On dead wood, Knysna, *Keet* (van der Byl 710); "Tuin van Eden", Knysna, van der Byl 2256.

3. *Xylaria cubensis* Mont.

Syll. Crypt. p. 202. 1856.

Hypoxyton cubensis Mont., Cent. 2, n. 29. Ann. Sci. Nat. 2nd ser. 13: 1840, and Fl. of Cuba, p. 347, t. 13, f. 1. 1842.

Xylaria fusca Lloyd, Myc. Writ. 5: 770, f. 1155, 1156. 1918.

Stroma cylindric to clavate, apex rounded, usually terete but occasionally compressed, single or sometimes two, united at base, with fertile clava glabrous, fairly smooth, dark brown pellicle and perithecial projections evident with obtuse dark papillate ostiola, at first solid white inside but becoming hollow with extreme age, 1-4 \times .4-.8 cm. or wider when compressed; with smooth brown stipe, 1-4 \times .2-.4 cm.; perithecia in periphery with cylindric asci, p. sp. 60-70 \times 6-8 μ with stipe 45-55 μ long; ascospores inequilaterally elliptic, brown, 10 \times 4 μ .

On wood. Common in the tropics and semitropics of world.

This species is similar to *X. allantoidea* Berk., but differs in being dark brown rather than copper colour and in the smaller spores, 10 \times 4 μ as against 10-14 \times 4-6 μ .

This has not previously been described from South Africa. Lloyd (21) described the Cuban type.

Material Examined.

On wood, Eshowe, Zululand, *Rump* 385a, 30238.

4. *Xylaria reticulata* Lloyd.

Myc. Writ. 7: 1354, pl. 333, f. 3169, 3170. 1925.

Stroma stout, cylindric to clavate, terete, with obtuse fertile apex and brief stipe, clava with light yellowish-brown pellicle, splitting in lines, and checked in fine reticulations, glabrous, at first white and solid inside, later becoming hollow and involute; perithecia immersed, ovate to semiglobose, with small papillate ostiola; asci cylindric, paraphysate; ascospores inequilaterally elliptic, brown, $18-23 \times 7-7 \mu$.

This species is very similar in size and shape to *X. cubensis*, but differs in spore dimensions and surface reticulations. Then from *X. tabacina* it is distinguished by the surface markings.

Material Examined.

On rotten wood, Knysna, *van der Byl* 1350, in Lloyd's Herbarium (Type), and part of specimen in *van der Byl* Herb.; Knysna, *van der Byl*, 11887 in Lloyd Herb. under *X. rhopaloides*.

5. *Xylaria variabilis* Welw. & Curr.

Fungi angol., Trans. Linn. Soc. 26: 280, t. 18, fig. 7. 1868.

Stroma cylindrical with obtuse fertile apex and very brief stipe, 3-4 cm. high and 2-4 mm. thick; clava with thin dark brown crust, marked with longitudinal lines with protruding dark ostiola, white inside, becoming hollow; stipe black, rugose, glabrous; asci cylindric, paraphysate; ascospores navicular, brown, $9-11.5 \times 4-6 \mu$.

The writer has not seen the type, and the above description is drawn from the African specimens determined by Lloyd. The latter (29) and *van der Byl* (2) cite this species. Lloyd, fig. 909, illustrates *X. variabilis* and thinks it close to *X. graminea* Mont. However, the writer finds the Lloyd specimen to be brown rather than the light slate grey of *X. graminea*. Also it is much smaller and more fragile. The relationship of this specimen is entirely with the *X. Guyanensis-X. arbuscula* group and is very close to *X. cristata* Speg.

Material Examined.

On burnt stump, Durban, *van der Byl* 771; Lloyd Herb. and Herb. *van der Byl*, Stellenbosch.

6. *Xylaria arbuscula* Sacc.

Michelia 1: 249. 1878.

Stroma slender, single or often much branched or compressed with abruptly pointed sterile apices, and slightly expanded fertile region; clava striate with fine raised bands, glabrous and even, but becoming black and torulose in old specimens, $2-15 \times 1-2$ mm., with stipe smooth or villous with long hairs, 4-40 mm. in length and 1.5 mm. in diameter; perithecia globose with cylindric asci, p. sp. $75-95 \times 6-7.5 \mu$ with stalks $50-70 \mu$ in length; ascospores inequilaterally elliptic, brown, $11-16 \times 5-7 \mu$; paraphysate.

On wood. Common in tropics.

This species has been confused with *X. apiculata* Cke. in South African literature. *Van der Byl* (1) gives the spores of the latter as $11-15 \times 4-6 \mu$, but those of the type at Kew are much larger, $14-22.4 \times 6-9 \mu$. Nos. 11540, 23170 and 28484 show very well the dark brown striations of the club in Saccardo's Myc. Ven. 1192. These lines tend to disappear in old specimens and they become black roughened with projecting perithecial forms. The writer (38) has previously separated *Xylariae* of this type. *Van der Byl* (1) describes it under *X. apiculata*. Hopkins (11) also cites the latter name, but the writer has not seen his specimens.

Material Examined.

On wood and bark, Natal, *Medley Wood* 324, 11138; Winter's Kloof, Natal, *Doidge*, 2166; Rikatli, Mozambique, *Junod*, 11540; Xumeni Forest, near Donnybrook, *Morgan and Doidge*, 27729, 30475; Fountains Valley, Pretoria, *Bottomley and Lansdell*, 28621; Elim, Northern Transvaal, *Watson*, 28484; Nottingham Road, Natal, *van der Byl* 541, 31806.

On damp soil, Fountains Valley, *Reinecke*, 23170.

7. *Xylaria multiplex* (Kze. ex Fr.) Berk. & Curt.

Jour. Linn. Soc. 10: 381. 1869.

Sphaeria multiplex Kze. ex Fr., Linnæa 5: 532. 1830.

Stroma slender, simple or much branched from base or above, branches terete or flattened with apical sterile points; with fertile clava, brown with raised lines, smooth,

with age almost black and uneven from perithecial projections, $10-30 \times 1-2$ mm.; with stipe slender, glabrous or tomentose, 3-30 mm. high and .5-1 mm. in diameter; perithecia globose to ovoid with inconspicuous papillate ostiola; asci cylindric, p. sp. $65-80 \times 6-7 \mu$ with stipe $30-50 \mu$ long; paraphysate; ascospores inequilaterally elliptic, brown, $9-12 \times 4-5 \mu$.

Lloyd (24) and later van der Byl (1) confused this species with *X. ianthino-velutina* Mont. However, it grows on wood rather than fruits and has the same general appearance as *X. apiculata* and *X. arbuscula* and differs chiefly in the smaller spores.

Material Examined.

On bark and wood, Buccleuch, Natal, *Leighton*, 11694; Boschfontein, near Wolhuter's Kop, Rustenburg District, *Doidge and Bottomley*, 32151; Marwaqa Forest, near Bulwer, Natal, *Doidge*, 32152.

8. *Xylaria bulbosa* (Pers. ex Fr.) Berk. & Br.

Outl. Brit. Fung. p. 385. 1860.

Sphaeria bulbosa Pers., Obs. Myc. 2: 63, tab. 1, f. 1, ad. 1799.

Sphaeria bulbosa Pers. ex Fr., Syst. Myc. 2: 327. 1823.

Sphaeria corniformis Fr., Elench. Fung. 2: 57. 1828.

Xylaria corniformis Fr., Summa Veg. Scand. p. 381. 1849.

Stroma cylindric-clavate, somewhat compressed or terete, simple or occasionally several from a common base; clava dark brown to black, very moriform from conic perithecial projections, glabrous, with apical sterile point, white inside, solid, 1.5 cm. high and 2-6 mm. in diameter, with short stalk 2-6 mm. high and 2-3 mm. thick, brown, glabrous with purple pannose bulbous base; perithecia small, closely packed, ovoid, with cylindric asci, p. sp. $55-67 \times 7 \mu$, with stalk $40-50 \mu$ long; paraphysate; ascospores navicular to elliptic, brown, $8-10 \times 4-5 \mu$.

On wood.

This old Persoon name has priority over the later *corniformis* of Fries. Many of the specimens in herbaria named the latter are *bulbosa*. This form and *X. cubensis* and *X. castorea* usually have an enlarged base, and all three have spores of about the same size. *X. bulbosa* differs from *X. castorea* in possessing the moriform, projecting perithecia and pointed apex and from *X. cubensis* in these characters and in the absence of the smooth surface of the latter.

Van der Byl (2) describes both *X. castorea* and *X. corniformis* and it is not possible to determine from his descriptions the species, but his specimens at Stellenbosch are all *X. castorea*.

Material Examined.

On wood, Pillansberg, near Rustenburg, *Wager*, 23613.

9. *Xylaria ianthino-velutina* Mont.

Syll. Crypt. p. 204. 1856.

Hypoxyylon ianthino-velutina Mont., Ann. Sci. Nat. 2nd ser. 13: 348. 1840.

Stroma slender with acute sterile apex, cylindrical to compressed, single or occasionally dichotomously branched above, 2-6 cm. high and 1-1.5 mm. in diameter, fertile clava, dark brown to black, with brown tomentose hairs surrounding perithecia, later glabrous and strongly moriform from the rather wide perithecial elevations, white inside and solid; stipe short, black, villous with long brown hairs, 2-10 mm. high and 1 mm. in diameter; perithecia large, globose-flattened with small black papillate ostiola; asci cylindric, p. sp. $90-92 \times 5-6 \mu$, with stipe $23-46 \mu$ long; ascospores brown, straight to inequilaterally elliptic, $8-11 \times 4-4.5 \mu$.

On parts of old fruits, especially legumes. Common in tropics.

The staghorn branching in part of the type, *Leprieur* No. 574, and also in No. 27727 below, is not typical, as most of the stromata are simple with long pointed apices.

This differs from the *arbuscula-multiplex* group in the lack of the split brown pellicle. It is more closely related to *X. Hypoxyylon*, from which it is distinguished by the more prominent perithecia and longer sterile apices as well as differences of substrate.

The South African specimens are identical with those from South America and the southern United States in all characters except the spores, and they average somewhat smaller. This is probably sufficient to create a new variety.

Lloyd (24, 26) at first named this fungus *X. multiplex* and placed as synonyms every species with similar appearance and dichotomous branching irrespective of spore dimensions. However, the Weigelt specimen of *multiplex* and the Leprieur specimen are distinct, and Lloyd (29) later recognised this difference. Van der Byl (1) followed the earlier determination of Lloyd in naming his specimens *X. multiplex*.

Material Examined.

On fallen fruits of *Strychnos Gerrardi*, Stella Bush, Durban, *Bottomley*, 12315 (Lloyd as *X. multiplex*); Stella Bush, Durban, *van der Byl* 665, 31990.

On bark (substrate unrecognisable), Xumeni Forest, near Donnybrook, *Morgan and Doidge*, 27727.

10. *Xylaria Oxyacanthae* Tul.

Sel. Carp. Fung. 2: 15, tab. 13, figs. 1-10. 1863.

X. Fuckelii Nits. Pyr. Germ. p. 7. 1867.

Stroma slender, dilated upward with sterile tip, usually simple, with clava terete or more often flattened, glabrous, with very small evident perithecial elevations, with surface grey to finally black, white inside, 2-4 cm. high and 1.5-3 mm. wide; with stipe .5-2 cm. high, hairy, later glabrous, brown, with enlarged purple pannose base on seeds; perithecia small, densely crowded, ovoid, with small papillate ostiola; asci cylindric, p. sp. 70-80 \times 6-7 μ , with stipe 35-50 μ long; ascospores inequilaterally elliptic, dark brown, 10-12 \times 4-5 μ ; paraphysate.

The stroma grows from seeds or old fruits buried in the soil. Common in Europe and America as well as Africa.

This differs from the other species on fruits in having spores 10-12 \times 4-5 μ , as against 12-16 \times 5 μ in *X. carpophila* and 12-16 \times 5-7 μ in *X. persicaria*. Then from *X. ianthino-velutina* it differs in possessing smaller more immersed perithecia, and in lacking the brown tomentose hairs and the long point to the club. There is no essential distinction between this species and *X. Hypoxylon* except that of the substrate.

Nitschke changed the name to *X. Fuckelii* because he found it on many fruits besides those of *Crataegus*. This would not be a valid reason for such action.

Material Examined.

On fruits, Fountains Valley, Pretoria, *Bottomley*, 20391.

11. *Xylaria Hypoxylon* (L. ex Fr.) Grev.

Flor. Edin. p. 355. 1824.

Clavaria Hypoxylon L., Sp. Pl. p. 1182. 1753.

Valsa digitata Scopoli, Flor. Carniol. 2: 398. 1772.

Clavaria hirta Batsch, Elench. Cont. 1: 229. 1783.

Sphaeria cornuta Hoff., Veg. Crypt. 1: 11. 1787.

Sph. digitata Bolton, Fungi Halif. 3: 130. 1791.

Clavaria cornuta Bull., Champ. Fr. tom. 1, p. 193, t. CLXXX. 1791.

Sph. ramosa Dicks, Plant. Crypt. Brit. 4: 27. 1801.

Sph. Hypoxylon Fr., Syst. Myc. 2: 327. 1823.

Stroma slender with sterile apices, compressed and dilated upward, occasionally terete, simple or more often divided from the base or above, 3-8 cm. high; fertile clava with black surface and white interior, glabrous, even or roughened with fairly prominent perithecial elevations, 10-40 mm. high and 1.5-3 mm. in width, with stipe short, 1-1.5 mm. in diameter, hairy but smooth with age; perithecia small, ovate, usually closely packed, with small papillate ostiola; asci cylindrical, p. sp. 70-80 \times 6-8 μ with stipe 40-60 μ long; paraphysate; ascospores inequilaterally elliptic, dark brown, 10-14 \times 4-5 μ .

The perithecia are not in lines as in *X. multiplex* and are more deeply immersed in the stroma than in *X. ianthino-velutina* or *X. Oxyacanthae*. The stipe is often covered with long hairs, but smooth forms are also found that differ in no other respects. The writer has seen no mature specimens that could be determined accurately from South Africa, and most of the references have been based on immature forms. Common on sticks and bark all over the world.

The species has often been cited; for example, Cooke (7), Medley Wood (43) and Lloyd (28) describe it, but on immature specimens.

12. *Xylaria heloidea* Penz. & Sacc.

Malpighia 11 : 498. 1897 and Icones Fung. Javan. p. 30, tab. XXI, f. 3. 1904.

Stroma consisting of a semiglobose fertile head 1-1.5 mm. high and 1-2 mm. in diameter; with an apical aristate prolongation up to 3 mm. in length, and a filiform stipe 7-20 mm. long and .4-.7 mm. in diameter; clava dark brown glabrous, uneven from acute perithecial elevations; perithecia semiglobose with papillate ostiola; asci cylindric, p. sp. $70-95 \times 7-8.5 \mu$ and stipe $30-45 \mu$ in length; ascospores navicular-elliptic, brown, $14-16 \times 4.5-6 \mu$;

The type is on rotted parts of legumes.

Lloyd (26, 27) describes this species from South Africa.

Material Examined.

On *Strychnos* sp., on rind of fruit, Rikatli, Mozambique, *Junod*, 11618. Det. Lloyd.

13. *Xylaria schreuderiana* van der Byl.

Ann. Univ. Stell. 10 : 3. 1932.

Stroma in rather closely packed groups, consisting of a fertile clava, subglobose to short cylindric with a brief sterile pointed apex, dark brown to black, surface glabrous, slightly uneven from projecting perithecial elevations, white inside, up to 2 mm. in diameter; with short nearly filiform stipe, black, rugose, .5 mm. thick and up to 5 mm. long; perithecia globose, black, ostiola not prominent; asci cylindric, p. sp. $120-180 \mu$ with stipe 65μ long ascospores monostichous, brown, navicular, $20-28 \times 8 \mu$.

This species differs from *X. heloidea* in less prominent ostiola and in larger spores.

(On wood. Known only from type locality.

Material Examined.

On dead wood, Knysna, *van der Byl* 1365.

14. *Xylaria aristata* Mont.

Ann. Sci. Nat. 4th ser. 3 : p. 107, t. 5, f. 6. 1855.

Stroma with semiglobose to short-cylindric, aristate head, with elongate filiform stipe; clava light brown, glabrous, sharply tuberculate with protruding perithecial elevations; 1-3 mm. long and .5-1 mm. in diameter, with glabrous, brown stipe 8-30 mm. long and .3-.5 mm. in diameter, perithecia ovate, not crowded, with prominent papillate ostiola; asci cylindric, p. sp. $57-70 \times 7 \mu$ and stipe $35-47 \mu$ long; paraphysate; ascospores inequilaterally elliptic, brown, $10-12 \times 5-6 \mu$.

On dead leaves.

This species differs from other species occurring on leaves as follows. *X. filiformis* possesses perithecia more or less scattered on the stem and they are not grouped in a definite head. *X. appendiculata* has similar spores and much the same type of head, but has an appendage at each end of the spore. Petch (41) describes *X. ocephala* Penz. & Sacc. from Ceylon, also on leaves, with spores $12-13 \times 6-7 \mu$. The spores of the type, however, are given as $9 \times 3-4 \mu$, and so it is possible that Petch had before him *X. aristata*.

Material Examined.

On dead leaves, Fountains Valley, Pretoria, *Parkes*, 21199.

15. *Xylaria vaporaria* Berk. & Curr.

Trans. Linn. Soc. 24 : 157, t. 25, f. 17. 1863.

Stroma consisting of a semiglobose to conic fertile head with pointed apex, 3-5 mm. high and 2-4 mm. in diameter, and a long filiform subterranean stipe, 5-7 cm. long and .5-1.5 mm. in diameter; clava dark brown glabrous but roughened with fragariform perithecial elevations; perithecia with faintly papillate ostiola each in centre of a light truncate ring; asci broadly cylindrical, $190-210 \mu$ long and $20-30 \mu$ wide with very brief stipe; paraphysate; ascospores dark brown, broadly elliptical, $40-50 \times 18-23 \mu$, surrounded by hyaline sheath.

A connection between the stipe and the subterranean sclerotium has been demonstrated, but is not evident in the specimens cited below.

No. 2159 is exactly like the English type at Kew Herb., and both are very near *X. pedunculata* Dicks. ex Fr. Lloyd (30) fig. 2876 is the type of the latter and figs. 2877 and 2878 are from the type of *X. vaporaria*. No. 30922 is sterile, a much branched sclerotial mass that may belong here.

Material Examined.

In *Chrysanthemum* beds, Krantzpoort, Ermelo, de Villiers, 2169.

From mushroom beds, Durban, African Mushroom Industries, 30922.

16. *Xylaria nigripes* (Klotzsch) Oke.

Grev. 11: 89. 1883 and Sacc. Syll. Fung. 9: 527. 1891.

Sphaeria nigripes Klotzsch, *Linnaea* 7: 203. 1832.

Stroma slender, cylindrical, with obtuse apex, with long subterranean filiform stipe, arising from sclerotium; fertile clava terete, light brown, becoming black with age, glabrous, sharply tuberculate with perithecial projections, 1-3.5 cm. in length and 2-4 mm. in diameter, with stipe glabrous, rugose, up to 9 cm. in length and 1.5 mm. in diameter; sclerotia globose to fusiform, black, 2-3.5 cm. in diameter, or 2-8 × 5-1.5 cm.; perithecia small globose to ovate, about 250 μ in diameter, with prominent papillate ostiola; asci cylindric, p. sp. 28-32 × 4.5-5 μ with stipe about 14 μ in length; paraphysate; ascospores very small, broadly elliptic, dark brown, 4.5 × 2.5-3 μ .

From old termite nests. Africa and Asia.

Petch (40) describes the sclerotium and also the perithecial stroma and Lloyd (21) illustrates the sclerotium and later, he (26) cites the fungus from South Africa. No. 8807 below was determined by Lloyd. Cooke (l.c. pl. 163, fig. 23) also gives a good illustration of the fertile club and spores.

Material Examined.

Among grass, Botanical Gardens, Durban, Medley Wood, 7766 and 9498 (fertile.)

On comb of *Odontotermes badius*, Daspoort, Pretoria, Kresfelder, 20368; without locality, Fuller, 11327 (sclerotia).

In old termite nests, Pretoria, Pole Evans, 8807, det. Lloyd; Wolluter's Kop, Maynard, 15425 (sclerotia); Standerton, Murray, 29712; Pietermaritzburg, Fuller, 1900 (fertile); Toowoomba, Warmbaths, Irvine, 28646 (fertile).

17. *Xylaria castorea* Berk.

Flora New Zealand 1: 204, tab. CV, f. 10, 1855.

Stroma stout, often compressed-obovate, but more rarely clavate-terete, with obtuse fertile apex, black, rugose-scaly, and inside white and solid; with very brief constricted stipe usually bulbous at base and purple pannose, 2-6 cm. high and .5-3 cm. wide; perithecia ovate to semiglobose, not crowded, with obtuse prominent black ostiola; asci cylindrical, p. sp. 50-65 × 6-7 μ with stipe 30-45 μ long; paraphysate; ascospores inequilaterally elliptic with rounded ends, dark brown, 8-10 × 4 μ .

This species and *X. bulbosa* have often been named *X. corniformis*. It differs from *X. bulbosa* in possessing a more rounded apex and less prominent perithecia. The general habit is much like *X. polymorpha*, and could well be considered a small spored form of that species. The ostiola are large and quite obtuse and the shape of the stroma varies from terete to very wide and compressed until often it is fasciculately branched from the base.

South African references to *X. castorea* are Lloyd (29) van der Byl (2) and Hopkins (11).

Material Examined.

On *Milletia Sutherlandii*, on wood, St. Johns, District Forest Officer, 6929.

On wood, Eshowe, Zululand, Rump 385b, 30239.

On wood, Knysna, Duthie (van der Byl 1103); "Tuin van Eden", Knysna, van der Byl 2224; Knysna, van der Byl 2254, 2260 (all sub *X. Corniformis* in Herb. van der Byl).

On rotten wood, Knysna, van der Byl 1329 (sub *X. hippoglossa* in Lloyd Herb. No. 11874).

18. *Xylaria anisopleura* Mont.

Syll. Crypt. p. 204. 1856.

Sphaeria anisopleura Mont., Ann. Sci. Nat. 2 ser. 13: 348, 1840.

Stroma stout, with rounded fertile apex, extremely variable in shape, from semiglobose and always sessile to stipitate, 3-5 cm. high and broadly clavate; clava black, tuberculate from broad perithecial elevations, solid and white inside with stipe represented by a brief central attachment or short and thick, dark brown, at first tomentose then glabrous;

perithecia in periphery, ovate, with small black papillate ostiola, often indistinct; asci cylindrical, p. sp. $161-172 \times 11.5 \mu$ with stipe 50μ long; paraphysate; ascospores oblong-elliptic, brown, $25-33 \times 7-10 \mu$.

The South African specimen cited below is the small hypoxyloid form of this species and is closely related to, if not identical with *X. haemorrhoidalis* B. & Br. from Ceylon. Semiglobose forms with a flat base as described by Petch (41) when considered alone would be placed in *Penzigia*, but as this species is just as often globose-clavate to almost cylindrical with a distinct stipe, it will have to remain in *Xylaria*. The tuberculate, fragariform stromal surface distinguishes it from hypoxyloid forms of *X. polymorpha*.

Van der Byl (1) describes this species, but no specimen was found in his herbarium. Lloyd (21) has listed synonyms and later (29) fig. 2700 illustrated the part of the type at Kew.

Material Examined.

On log, Winter's Kloof, Natal, *Doidge*, 2551.

19. *Xylaria polymorpha* (Pers. ex Fr.) Grev.

Flor. Edin. p. 355. 1824.

Valsa clavata Scop., Carn. 2: 398. 1772.

Clavaria digitata Bull., Hist. Champ. Fr. 1: 192. t. 220. 1791.

Sphaeria polymorpha Pers., Obs. Myc. 2: 64, t. 2, f. 2-5. 1799.

Sphaeria polymorpha Fr., Syst. Myc. 2: 326. 1823.

Stroma erect, thick-clavate and 2-12 in a fasciculate group from a common base, or subglobose and variously undulate and deformed, with rounded fertile apices; fertile clava rugulose-roughened, black, glabrous, but with perithecia evident in age, solid, white inside, $3-10 \times .6-1.5$ cm. or 2-4 cm. high and 1-3 cm. wide, with thick abbreviated stipe or almost none, dark brown, .5-4 cm. high and .4-1 cm. thick; perithecia ovate to globose in periphery with very obtuse dark ostiola; asci cylindric, p. sp. $150-175 \times 7-9 \mu$, with stipe $30-45 \mu$ long; paraphysate; ascospores subfusiform to elliptic with obtuse ends, brown, $25-34 \times 6-8 \mu$.

As with the two previous species, there is no definite shape concept that will characterise this species. The type, *Persoon* No. 235, at Leiden, is branched from the base and is very similar to No. 9046 cited below. Lloyd (26) determined this as *X. pistillaris*. That name was set up by Nitschke for a variety of *X. polymorpha*, characterised by upright more or less terete branches, but it has no merit as it indicates only an environmental form. Kalchbrenner (12), Lloyd (19) and van der Byl (1) have described the species from South Africa.

Material Examined.

On stump of stinkwood, *Ocotea bullata*, Knysna, *Laughton* (van der Byl 253).

On *Royena lucida*, Amatola Mts., Cape, *Keel*, 9046 (Det. Lloyd as *X. pistillaris*).

On wood, Buccleuch, Natal, *Leighton*, 11695; Eshowe, Zululand, *Rump* 385b, 30239; Bluff, Durban, *Moonsamy* (van der Byl 365) 31704; Durban, van der Byl 213, 310.

Excluded *Xylaria* Names.

There are some other specific names in South African literature that are either based on indeterminate conidial stages, or on types that have not been studied by the writer. In any case they are listed below and reasons for their exclusion from the previous systematic account are given.

1. *Xylaria allantoides* Berk.

Described by Hopkins (11) from a specimen found on stem of *Brachystegia* sp., Umtali. The writer has not seen this collection.

2. *Xylaria capensis* (Lev.) Sacc.

No specimen was available for study.

3. *Xylaria carpophila* Pers. ex Fr.

Cited by Henning (9) on fruits of a *Strychnos* sp., Tugela River, Natal. The only specimens examined on such fruits are those determined as *X. ianthino-velutina* and *X. helidea*.

4. *Xylaria corniformis* Fr.

This name is a synonym of *X. bulbosa*, but the van der Byl (2) specimens belong under *X. castorea*.

5. *Xylaria digitata* (L. ex Fr.) Grev.

Described by Welwitsch and Currey (Trans. Linn. Soc. 26 : 287, 1868) on *Welwitsch* No. 136b, Mossamedes, and also by Lloyd (26) from No. 8976, Hennops River, eeg. van der Byl.

There is some question concerning the proper concept for this species. Lloyd (29) accepts a fungus with few or many clubs rising from a common base or even solitary, glabrous, with quite protruding perithecia, and spores about $18-20 \times 5-6 \mu$. Then he considers this the same as the American *X. cornu-damae* (Schw.) Berk.

The general habit of *X. digitata* and *X. cornu-damae* is the same, but the spores of the latter average somewhat longer, up to 25μ , and so the writer considers them distinct.

The concept of *X. digitata* is not that of Persoon as indicated by Lloyd, but comes from a Berkeley specimen labelled *Sphaeria digitata* Ehrh., Lavender Hill, W. Pamplins. This one fully equals Lloyd's description as given above, but the Persoon specimens in Leiden and most of the Berkeley collections are immature fasciculate forms of *X. polymorpha*.

The writer has not seen *Welwitsch* No. 136b, but has studied the van der Byl collection, No. 8976 in the Pretoria Herbarium, and the same one in the Lloyd Herbarium. The latter come within the general concept of the species according to the Berkeley specimen, but differ in the spores, which are too small, $9-11 \times 4-5 \mu$. This is sufficient to warrant another specific name.

6. *Xylaria fistulosa* (Lev.) Fr.

This was described by Lloyd (17) from *Duthie 51*, on rotting log, Knysna Forest. No specimen has been found in the Lloyd Herbarium, and so the writer has not studied it. Van der Byl considers it equal to *X. tabacina*.

7. *Xylaria hippoglossa* Speng.

Lloyd (30) determined a van der Byl collection from Knysna, No. 11874, as this species. Van der Byl (3) also describes the specimen. The collection has spores $8-11.5 \times 4-5 \mu$ and is a typical *X. castorea*.

8. *Xylaria Myosurus* Mont.

Both Lloyd (29) and van der Byl (2) cite this name, but base it on immature material. The Lloyd specimen, No. 12773, has not formed perithecia, and it is impossible to guess at its identity.

9. *Xylaria rhopaloides* Mont.

This name has been cited from South Africa by Cooke (7), Kalchbrenner (14), Wood (43) and Lloyd (20, 30).

The Medley Wood collection, *Medley Wood 346*, 11137 in the Pretoria Herbarium, is conidial and indeterminable. The Lloyd specimen, No. 11887, from van der Byl, Stellenbosch, is identical with Lloyd's *X. reticulata*. The writer has not seen the type of this species.

10. *Xylaria Schweinitzii* Berk. & Curt.

Cited by Lloyd (23, 28) and van der Byl (2) on rotting wood, Knysna. Van der Byl had old specimens, and so finding no spores, preferred to wait for a positive identification. The writer has not found this species among the African collections.

11. *Xylaria stilboides* Kalch. & Cke.

Described by Kalchbrenner and Cooke (13) on *MacOwan 42*. The writer has not seen these specimens.

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A REVISION OF THE SOUTH AFRICAN MICROTHYRIACEAE.

By Ethel M. Doidge.

The first reference to a fungus belonging to the *Microthyriaceae* collected in South Africa appears to be a description of *Asterina sphaerasca* by von Thumen (44) No. 119 of his *Fungi austro-africani*, published in *Flora*, 1878. This fungus was found by MacOwan (*MacOwan 1273*) at Olifants Hoek in the Uitenhage district. A number of specimens collected by MacOwan in the eastern Cape and by Medley Wood in Natal were described by Kalchbrenner and Cooke in numbers of *Grevillea* published 1880-1882, and later the number of known South African species was increased by Sydow, who described specimens sent to him from the Pretoria Herbarium. In 1920 (Doidge 9) a study of the *Microthyriaceae* in the Cryptogamic Herbarium at Pretoria was based on Theissen's papers in the *Annales Mycologici* and elsewhere (36-40) and on his monograph of the genus *Asterina* (41). In more recent years, fairly extensive collections have been made, and some of the fungi have been described from time to time (Sydow 34, van der Byl 4-6, Doidge 11-13). It has long been evident, however, that a more critical study of the South African members of the *Microthyriaceae* is desirable. Not only is more abundant material now available, but great advances have been made in the study of the phanerogamic flora, and it has been possible to revise the identification and nomenclature of the host plants. This is a matter of considerable difficulty, as it is unusual to find either flowers or fruit on the plants when the fungi are mature. In earlier days a number of mistakes were made in identification of the hosts, and this led to some confusion amongst the species of fungi. I am indebted to my colleagues in the phanerogamic herbarium for their kind and willing co-operation in the revision of the hosts, and particularly to Miss I. C. Verdoorn and Miss H. Forbes, who examined and identified a large number of difficult specimens.*

CHARACTERS OF THE GROUP.

In recent years, the views of mycologists on the value of certain characters for diagnosis have undergone some modification, and it has been found that some of them, such as the presence or absence of paraphyses, are untenable as generic distinctions. A brief review of the characters of the family in the light of recent investigations may be of interest.

Spore germination.

In most of the genera studied, the spores are brown, 2-celled and more or less constricted at the septum. The spore usually germinates from the upper or lower end or from both ends (Theissen 41). In some cases, a hyphopodium is first formed, and in close proximity to this a hypha emerges, which grows out and branches to form the more or less extensive superficial mycelium; this method commonly occurs in the species of *Asterina*. In other cases, the 'primary' hyphopodium does not appear, but hyphae grow from either end of the spore, and on these hyphopodia are formed early, e.g. *Asterina Bottomleyae*. Sometimes germination takes place near the septum as in *Asterina dissiliens*. In many species, particularly in the genus *Asterina*, the spore can long be seen unchanged in the centre of the fungus colony, and mature spore characters can often be studied from this when spores still in the thyriothecia are more or less immature (41). In a number of species with node cells and lacking typical hyphopodia on the hyphae, the spores are thin-walled; on germination, a single, 1-celled hyphopodium develops near the upper end; then the spore collapses, two or more hyphae grow from the base of this primary hyphopodium and extend to form the superficial mycelium (Plates LXI, LXII). In some species it frequently happens that the spores germinate in the ascus.

As a rule, the developing mycelium very early assumes its mature characters, especially the definite colour, breadth and septation of hyphae and the form of branching, but less frequently there is a distinct difference between old and young hyphae; colour deepens with age, and mature hyphae may differ in breadth and septation from those recently developed.

* Deur die goedgunstigheid van die trustees van die van der Byl Herbarium en van die Stellenbosse Universiteitsraad is 'n geleentheid vir die bestudering van hierdie groep swamme aangebied, wat in die versamelings van wyle Dr. van der Byl te vinde is. Verwysing na hierdie monsters sal in verband met die verskillende soorte gevind word.

Mycelium.

The *Microthyriaceae* have been characterised by Theissen and Sydow (43) as fungi with superficial ascomata and 'free mycelium' when present, also superficial. Arnaud (3), however, points out that these fungi are parasites and that the absorbing apparatus of superficial forms has been incompletely studied. In the genera under consideration, the absorbing apparatus is much reduced, and is usually represented only by haustoria, which penetrate the epidermal or palisade cells of the host. The haustoria of the superficial fungi have been studied by Marshall Ward (45), Maire (24) and Arnaud (1-3). The superficial mycelium develops centrifugally on the surface of the host, and consists of brown, cylindrical hyphae which are septate at fairly regular intervals, usually branch and anastomose freely, and finally become more or less closely reticulate. In colour the hyphae range from chestnut brown to olive brown and even greyish olive. Colour is often characteristic, and in this paper an attempt has been made to indicate colour as precisely as possible by comparison with Ridgway's colour charts (30). The external mycelium is in close contact with the host; cells from which haustoria develop are sometimes ordinary hyphal cells; more frequently this rôle is assumed by special cells of the hyphae, termed stigmocysts by Arnaud (3), which may be distributed along the hyphae and are then known as node cells, or on short special branches known as hyphopodia (Theissen 41) or stigmopodia (Arnaud 3). These special cells are usually more or less distended, but vary greatly in form in different species and may even have a slender extremity; their essential character is a small, paler spot, more or less conspicuous, which marks the point of emergence of the filament penetrating the cuticle to form the haustorium in the leaf tissues. The form of the hyphopodia is remarkably constant in the same species of the *Microthyriaceae*, and is a good diagnostic character (41).

Thyriothecia.

The thyriothecia develop on the mycelium in at least two ways (Theissen 41, Doidge 9 and Ryan 31). The first and most common method is from an intercalary cell of a hypha in which cross septa appear, thus forming two or more small, cubical cells—rarely more than 5—which give rise to bud-like growths, often lobed on their free margins and developing centrifugally. In the second method, the thyriothecium arises from the terminal cell of a short, lateral branch. Ryan mentions also a third method, more common in the genus *Meliola*, in which the thyriothecium develops from a hyphopodium. The thyriothecia are either circular in outline, or more or less elliptical to linear. Intermediate forms are found, and occasionally all forms, from round to linear can be found in the same species, or even on the same leaves. In some species (41) the thyriothecium has a distinct basal membrane, which is pale grey or fuscous, composed of radiating hyphae and a fairly exact copy of the covering membrane. This is sometimes firm, but often delicate and transient, so that it is easily destroyed by pressure, or traces of its presence only discernible at the edge of the ascoma.

The covering membrane is formed of radiating hyphae, which may be straight or more or less sinuous. It may open by means of a pore (*Microthyrium*) or, closed at first, break into triangular segments by the formation of radiating, stellate cracks (*Asterina*) or, in the case of linear ascomata, form a longitudinal fissure running almost the length of the covering membrane. In certain species, the covering membrane becomes strongly convex through the formation of a quantity of mucilage from the break-down of paraphysoids and other internal cells; the central part of the covering membrane then dissolves into mucilage and disappears almost entirely, leaving the asci embedded in a dirty brown, mucilaginous mass. Between the typical forms dehiscing by cracks and those in which the covering membrane is dissolved, there is a series of transition forms (Sydow and Petrak, 35 p. 246).

Typical paraphyses are sometimes found, which are regularly septate, sterile threads of limited length between the asci, often somewhat clavate at the tips and agglutinated (41). It is difficult in many cases to establish the presence of true paraphyses and to distinguish them from other sterile, intrathecial hyphae known as paraphysoids; in most genera, even those said to be characterised by the absence of paraphyses, definite, if sparse, paraphysoids are always present (Petrak 26).

Conidia.

The *Asterostomella* fructification, which is the pycnidial form of the genus *Asterina*, is well known. It has pycnidia similar in form to the thyriothecia, but usually smaller,

and continuous conidia, in which the brown colouring is continuous or is interrupted by a lighter or hyaline zone. These conidia vary in form and size and in their method of germination to a greater extent than indicated by Theissen (41). The pycnidial forms of other genera are not so well known. It is probable that a number of general classified with the superficial *Leptostromaceae* and placed in the group *Pycnothyriaceae* by von Höhnelt (16) and Diedeck (8) are conidial forms of *Microthyriaceae*, but they have not been connected with the ascus forms. The pycnidial form of *Lembosia eucalyptina* has been named by Petrak and Sydow (29) *Thyrimula eucalyptina*.

In the South African species of *Lembosia* and *Echidnodes* a number of conidial forms were found. The hyaline, ellipsoid conidia of *Echidnodes africana* resemble those of *Peltaster* Syd. (Ann. Myc. 15, 1917, p. 261); in *Ech. Hypolepidis*, the conidia are ovate or ellipsoid and olive buff, and possibly may be linked with the genus *Asteromula* Theissen (42), which is an aphyopodiate *Asterostomella*. The genus *Actinothyrium* P. Henn. (15) has 3-septate, hyaline, oblongfusoid conidia like those of *Ech. Acokantherae*. In *Lembosia piriensis* the pycnidial conidia are hyaline, bacillary; bodies similar to these have recently been described and figured by Luttrell (23) in *Morenoella quercina* as 'spermogonia', but proof of the nature and function of these bodies is lacking. Marshall Ward (45) described the formation of spermatia in *Asterina spissa*, but according to him erect clusters of delicate hyphae are produced on the mycelium and on the young thyriothecia; he was in doubt as to the nature of these structures, because of the difficulty in determining their exact relation to the mycelium. Arnaud (3) figures small hemispherical bodies in *Morenoella Mollenidiae*, similar to those found in *Lembosia piriensis* and *L. durbana*, but no reference is made to them in his text. There is no evidence that these have any sexual significance, or that they are other than pycnidia. In the genus *Clypeolella*, the conidia are 3-septate, usually brown, and are borne on the mycelium; dark mycelial conidia, 6-12-septate, were also observed in *Lembosia piriensis*.

It is possible that the varying conidial forms may be of value in grouping species, but further studies in this direction are needed.

CLASSIFICATION.

In their *Synoptische Tafeln* (4), Theissen and Sydow include in the Hemisphaeriales ascomycetes with flat, shield-shaped, dimidiate ascomata which are superficial or covered by the cuticle. Within this group, the *Microthyriaceae* are distinguished by their superficial ascomata and superficial "free" mycelium; fungi with superficial ascomata attached to an intramatrix hypostroma are placed in the *Polystomellaceae*. Arnaud (3), however, regards the *Polystomellaceae* as defined by Theissen and Sydow as large *Microthyriaceae* with plurilocular stromata and a more extensive intramatrix absorbing apparatus. He states that one finds intermediate forms which establish a gradual transition between the two types of stroma. The presence of superficial mycelium is in correlation with the humidity of the climate of regions where these fungi are found; they occur almost exclusively in tropical regions with a high rainfall, or in humid mountainous districts of more temperate regions. Arnaud contends that the belief in the absence of an intramatrix absorbing apparatus in the small *Microthyriaceae* is the result of incomplete investigation.

The present paper is restricted to forms included by Theissen and Sydow in the *Microthyriaceae*, and their classification is followed, with some modifications.

Generic Characters.

The largest number of the species found in South Africa belongs to the genus *Asterina*, which must now be taken to include the genera *Parasterina* and *Englerulaster*. Petrak (26) has pointed out that the presence or absence of paraphyses or paraphysoids alone cannot be used as a generic distinction between hemispherical forms. For example, *Asterina*, a genus in which paraphyses are said to be wanting, always has definite, if somewhat sparse, paraphysoids. The fact that these are numerous in *Parasterina* is therefore without generic significance and the genus *Parasterina* cannot be maintained; but as the species with definite, typical paraphyses resemble one another in a number of ways *Parasterina* may be retained as a section of the genus *Asterina*. For the same reason, the genus *Morenoella* must be united with *Lembosia*, and *Prillieuxina* with *Asterinella*.

The only difference between a typical *Asterina* and a typical *Englerulaster* is that in the latter genus the covering membrane of the thyriothecium becomes strongly convex through the mucilaginous dissolution of internal hyphae and is itself dissolved. Between this and the typical *Asterina* with stellate dehiscence there is a series of transition forms which are difficult to place. *Englerulaster* can probably be maintained as a section of

Asterina (Sydow and Petrak 35). The third section of the genus, *Chypeolaster*, is characterised by the presence of a basal membrane in the thyriothecium. This is readily recognisable when it is firm and definite, but it is possible that it may be overlooked in species where it is delicate or transient (41).

The genus *Seynesia* cannot be included in the *Microthyriaceae*, as Petrak (27) has pointed out that the type species of the genus, *Seynesia nobilis*, is identical with *Steganopycnis oncospermatis* and is a typical *Sphaeriaceae*. The genus *Arnaudiella* Petrak (27) has been established for *Microthyriaceae* with little or no superficial mycelium, radiating covering membrane with central pore and 2-celled dark spores, and *Ferrarisia* Petrak to include forms with 2-celled dark spores previously known as *Seynesia* spp.

The genus *Amazonia*, which is placed in the *Synoptische Tafeln* between *Halbania* and *Yatesula*, although it has an ascoma with slightly convex, radiating covering membrane, is not related to these genera but to *Meliola*, to which it approximates in habit and in development (Petrak 25). The single South African species of this genus, *Amazonia asterinoides*, originally named *Meliolaster Mackenzii* Doidge (10), has been described in a paper on the *Meliolineae* (14).

Mycelial characters are used as generic distinctions in this group. *Asterinella*; for instance, resembles *Asterina* but has no hyphopodia. Theissen includes forms with node cells, or intercalary stigmocysts, in the genus *Asterina*, but Arnaud regards this character as one of generic importance, and established a series of genera with "node cells" and elongated or round thyriothecia. Of these, *Asterolibertia*, comprising the species of the section *Nodulosae* of Theissen's sub-genus *Dimerosporium*, has been adopted for two South African species; these differ from *Asterina*, not only in the form and position of the stigmocysts, but in general habit and in spore germination.

Mycelial setae are rare in this group, but Arnaud (3) established the genus *Trichasterina* for a species, *Trichasterina Styrcis*, with distinct mycelial setae. One species of this genus has been found in South Africa.

MICROTHYRIACEAE Sacc.

Syll. Fung. II (1883) p. 658. Theissen and
Sydow, Ann. Myc. 15 (1917) p. 413.

Superficial mycelium septate, brown, reticulate, often with hyphopodia, or quite wanting; intramatrical mycelium much reduced and often only represented by haustoria. Ascomata (thyriothecia) superficial, scutate; covering membrane radial in structure, formed under a hypha, consisting of one or more layers of cells, dehiscing from the apex by an irregular circular pore, or by stellate or longitudinal fissures, sometimes the central portion becomes mucilaginous and breaks down irregularly ("mucose diffluent", Stevens and Ryan 32). Hypothecium flat or concave, colourless, thin, filamentous. Basal membrane thin, formed of a single layer of cells, or wanting. Asci basal, erect, parallel, or somewhat convergent, with or without paraphyses, broadly clavate or ovate, seldom cylindrical, without a pore. Epithecium, or agglutinated paraphysal layer, wanting, atypical or typical. Hymenium polyascous, one or more under one covering membrane, seldom monascous.

KEY TO SOUTH AFRICAN GENERA.

A.—No superficial mycelium.....Sub-family *Microthyriaceae* Sacc. and Syd.

(a) Thyriothecia rounded, spores 2-celled.

1. Spores hyaline, thyriothecia with central pore.

x. Thyriothecia closely crowded and more or less completely fused...

xx. Thyriothecia separate, sometimes confluent but not fused.....

2. Spores brown.....

(b) Thyriothecia linear, spores brown.....

B.—Superficial mycelium present.....Sub-family *Asterineae* Sacc. and Syd.

(a) Thyriothecia rounded.

1. Spores 2-celled, brown.

x. Typical hyphopodia present.

o. Mycelial setae present.....

oo. No mycelial setae.

// Conidia, when present, pycnidial, 1-celled.....

// Conidia mycelial, 4-celled.....

xx. No typical hyphopodia.

o. More or less swollen node cells distributed throughout hyphae

oo. Hyphae more or less even in thickness, no specialised node cells

(b) Thyriothecia linear.

1. Spores 2-celled, hyaline, no hyphopodia.....

2. Spores 2-celled, brown.

x. Hyphopodia present.....

xx. Hyphopodia lacking.....

1. *Calopeltis*.

2. *Microthyrium*.

3. *Ferrarisia*.

4. *Lembosinus*.

5. *Trichasterina*.

6. *Asterina*.

7. *Chypeolella*.

8. *Asterolibertia*.

9. *Asterinella*.

10. *Lembosiopeia*.

11. *Lembosia*.

12. *Echidnoides*.

CALOPELTIS Syd.

Ann. Myc. 23 (1925) p. 393.

No superficial mycelium. Thyriothecia densely crowded and often more or less completely fused, with a common, hyaline or sub-hyaline basal layer. Covering membrane radial in structure, composed of a single layer of cells, at first closed, then developing an irregular central pore. Asci fairly numerous, clavate, thick-walled, sessile, 8-spored. Spores broadly oblong-clavate, 1-septate, hyaline. Paraphysoids few, fibrose.

Calopeltis Jasmini Doidge nov. spec.

[Plate I.]

No superficial mycelium. Thyriothecia epiphyllous, densely crowded, forming more or less circular black spots up to 5 mm. diam.; frequently the centre of the spot is very dense, consisting of a more or less completely fused aggregate of thyriothecia 2-2.5 mm. diam., surrounded by a ring of younger thyriothecia, which are at first scattered, but early become fused in irregular groups as they develop. There is no discoloration of the leaf tissues.

Single thyriothecia more or less circular to angular, 100-150 μ diam. Compound covering membrane, composed of fused membranes of single thyriothecia; each individual membrane slightly convex, about 50 μ high in the centre, at first isabella colour to snuff brown,* becoming blackish brown, subopaque, but remaining paler in the centre and at the margin when the latter is free; usually completely fused and continuous with the covering membranes of adjacent thyriothecia; formed of radiating, irregularly sinuous hyphae 2-2.5 μ thick, central cells thin-walled, almost cubical, 2-3 μ long, loosely compacted, breaking down to form an irregular central pore 15-20 μ diam., cells near margin up to 15 μ long; free margins irregular and sometimes sub-fimbriate. Asci 8-spored, clavate or ellipsoid, straight or slightly curved, broadly rounded above, tapering more or less towards the sessile base, with a firm wall slightly thickened round the apex, 40-50 \times 12.5 to 15 μ . Spores more or less distichous, oblong-clavate, broadly rounded above, tapering gradually downwards, 1-septate, not constricted or very slightly so, smooth, hyaline, 12.5-16 μ long, upper cell ovate, 4-5 μ long and 4.5-5 μ broad, lower 7.5-10 μ long, 3.75-4.5 μ broad at the septum. Paraphysoids sparse, fibrose.

On *Jasminum streptopus* E. Mey., on leaves, Durban, Medley Wood, 9516.

MICROTHYRIUM Desm.

Ann. Sci. Nat. XV (1841) p. 138.

No superficial mycelium. Thyriothecia superficial, scattered or in groups, brown, radial in structure with a central pore. Hymenium simple, polyascous. Asci clavate, thick-walled, 8-spored. Spores 2-celled, hyaline.

KEY TO SPECIES.

- A.—Thyriothecia 240-260 μ diameter, spores ranuliform..... 1. *M. ranulisporum*.
 B.—Thyriothecia 150-200 μ diameter, spores ellipsoid..... 2. *M. maculicolum*.

1. **Microthyrium ranulisporum** Doidge.

Bothalia II (1927) p. 235.

[Plate IIa.]

No free mycelium. Thyriothecia hypophyllous, scattered or in small irregular groups, visible to the naked eye as fine black points. Thyriothecia discrete and circular in outline, 240-260 μ diam., or becoming confluent in pairs or small groups. Basal layer hyaline, structure not evident. Covering membrane pellucid, deep olive buff at the margin to buffy brown in the centre, slightly convex, about 30 μ high in the centre, with an irregularly round central pore ca. 20-30 μ diam.; composed of irregularly radiating, undulating and more or less tortuous hyphae 2-3.5 μ thick, margin very irregular, sometimes subfimbriate. In the young thyriothecia, the central cells which break down to form the pore are almost cubical; elsewhere the cells are longer, often 10-15 μ long. Asci very numerous, 8-spored, oblong-clavate, rounded above, tapering slightly or more definitely to a sessile base, 90-100 \times 10-14 μ , not staining blue with iodine. Spores distichous, hyaline or flavescent, clavate, straight or slightly curved, like tadpoles in shape, 1-septate, very slightly constricted, 25-30 μ long; upper cell ovate, 6.5-8.5 μ long and 3.5-5 μ broad, lower cuneate, often curved or bent, 16.5-23.5 μ long, 3 μ broad at the septum and tapering downwards to ca. 1 μ . Paraphysoids fairly numerous, hyaline, fibrose, sub-persistent.

On *Scolopia Mundtii* Presl., on leaves. Komgha, E. P. Phillips, 14152.

* For colour names in all descriptions cf. Ridgway (30).

2. *Microthyrium maculicolum* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 241, 280, Pl. XVIII, fig. 40.

Sub *Microthyrium annuliforme* Syd. in Stevens and Ryan The Microthyriaceae (1939) p. 20. [Plate IIb.]

No free mycelium. Thyriothecia epiphyllous, on leaf spots which are 4–8 mm. diam., or up to 10 mm., wood brown, becoming avellaneous in the centre, slightly raised, blister-like. Thyriothecia developing in a ring near the edge of the spot, numerous, irregularly placed, discrete or confluent in small groups, circular in outline, 150–200 μ diam., or flattened by contact and irregular. Covering membrane slightly convex, snuff brown to bistre, pellucid, formed of straight, radiating hyphae 3.5–5 μ thick; central cells almost cubical, 3.5–5 μ long, marginal cells up to 8 μ long or rarely up to 10 μ ; margin entire, smooth or slightly and irregularly crenate. Asci 6–8-spored, not numerous, usually 3–7 in each thyriothecium, ellipsoid, 70 \times 27 μ , or, more frequently, ovate, broadly rounded above, tapering downwards to a sterile base, 50–57 \times 30–43 μ ; uniformly thinly tunicated, wall ca. 1 μ thick. Spores conglobate, hyaline, ovate-ellipsoid, broadly rounded at both ends, 1-septate, not constricted, 19–25 μ long; upper cell larger, 10–15 μ long and 10–11.5 μ broad, lower 9–10 μ long and 7.5–9 μ broad. Paraphyses sparse, fibrose.

On *Capparis citrifolia* Lam., on leaves, Durban, Bottomley, 11668.

Stevens and Ryan (l.c.) consider this species identical with *M. annuliforme* Syd., an Indian species occurring on *Capparis*. Judging by the description the two fungi are very similar, but there are a number of minor differences. Authentic material of *M. annuliforme*, has not been available for comparison, and it seems preferable to retain the name *M. maculicolum* for the South African fungus until a comparison can be made.

FERRARISIA Sacc. emend. Petrak.

Sacc., Atti dell'Accad. Veneto-Trentino-Istria X (1917) p. 61

Petrak, Ann. Myc. 25 (1927) p. 343.

Superficial mycelium none, or very sparse and transient, consisting of thin-walled, subhyaline or very light olive brown, obscurely septate hyphae. Thyriothecia in groups often numerous and closely crowded and then becoming more or less confluent, usually somewhat angular and irregular in outline or slightly elongated, seldom almost circular; basal layer subhyaline, almost structureless; covering membrane dark brown, small-celled, radial at the margin, at first quite closed, finally breaking into a few obtuse, triangular portions through the formation of irregular or stellate cracks. Asci spherical or broadly ovate, 4–8-spored, with a thick, firm wall, sessile, immersed in a subhyaline or light olive brown, indefinitely filamentous, paraphysoidal, mucilaginous mass. Spores oblong, 1-septate long remaining hyaline, finally pellucid olive brown or blackish brown.

Ferrarisia Jasmini Doidge, nov. spec.

[Plate IIIa.]

No persistent superficial mycelium. Thyriothecia amphigenous, mostly epiphyllous, sometimes scattered irregularly, but usually more or less closely crowded in groups. Groups of thyriothecia irregularly circular, poorly defined and up to 7 mm. diam., often numerous and becoming confluent, so that the thyriothecia are more or less evenly distributed over the whole leaf surface. Thyriothecia always more densely crowded in the centre of the groups, comparatively distant and widely dispersed near the circumference; quite superficial and readily becoming detached from the leaf surface.

Single, isolated thyriothecia more or less circular in outline, 120–200 μ diam., very frequently becoming confluent in small or larger groups and then flattened laterally and obtusely angular. Basal layer flat, thin, hyaline, structure not evident. Covering membrane convex, ca. 20–25 μ high in the centre, black, carbonaceous, opaque, except near the margin, which is subopaque, snuff brown to bistre, structure only evident after bleaching; formed of rather sinuously radiating hyphae, 3–4 μ thick, closely articulated, cells mostly 5–8 μ long, margin irregular or briefly subfimbriate; at first closed, finally splitting by stellate cracks into ca. 3–5 broadly triangular segments. Asci not very numerous, ca. 10–15 in each thyriothecium, broadly ellipsoid to ovate, 8-spored, sessile, 35–40 \times 25–35 μ , often becoming more elongated at maturity, up to 60 μ long, with a firm wall, slightly thickened (ca. 5 μ) round the apex. Spores conglobate or indefinitely tristichous, oblong, rounded at both ends, 1-septate, rather deeply constricted, snuff brown, smooth, 22–25 μ long; cells ovate, upper 12.5–14 μ long and 10–11.5 μ broad, lower 10–11.5 μ long and 7.5–10 μ broad. Paraphyses indefinitely fibrose, breaking down early to form the light brownish olive mucilaginous mass in which the asci are embedded.

On *Jasminum angulare* Vaill., on leaves, Kentani Pegler, 2288.

LEMBOSSINA Theiss.

Ann. Myc. XI (1913) p. 437.

Like *Lembosia*, but without superficial mycelium.**Lembosina Rawsoniae** Doidge, nov. spec.

No superficial mycelium. Thyriothecia hypophyllous, barely visible to the naked eye, scattered irregularly; sometimes 2-4 individual thyriothecia which are in close proximity to one another become confluent, fuse at the ends and form compound ascomata which are often Y-, I- or X-shaped. Individual thyriothecia oblong or linear, tapering slightly to rounded ends, 200-400 μ long, 80-100 μ broad, most frequently 250-300 μ long, straight or slightly curved. Basal layer subhyaline, without definite structure. Covering membrane slightly convex, at first snuff brown, becoming darker, almost black and opaque in the centre, formed of slightly undulating, radiating hyphae, 1-1.5 μ thick, with cells 1.5-2.5 μ long, becoming pellucid and gradually paler near the margin, and fading into a short, indefinite hyaline zone; margin irregular but not fringed; at maturity dehiscing by an irregular longitudinal fissure running almost the length of the covering membrane. Asci numerous, ovate or clavate-oblong, broadly rounded above, sessile or with a short, peg-like foot, 8-spored, ca. 15-20 \times 7-10 μ . Spores subdistichous or conglobate, oblong or subclavate broadly rounded above, tapering more or less downwards, 1-septate, not constricted at the septum or barely so, at first hyaline, becoming deep olive buff, smooth, 7-10 \times 2.5-3 μ ; upper cell somewhat broader than the lower.

On *Rawsonia lucida* Harv. et Sond., on leaves, Hlinza Forest, Eshowe, *Gerstner*, 32662.

Very few mature spores were seen, although abundant material was examined; in mature thyriothecia, asci were either old and empty or immature, both conditions being found in the same thyriothecium; a few mature spores were found lying free in the thyriothecium.

TRICHAETERINA Arnaud.

Ann. de l'École Nat. d'Agric. de Montpellier,
nouv. sér. 16 (1918) p. 172.

Thyriothecia and mycelium similar to those of *Asterina*, but mycelium furnished with setae.

Trichasterina Popowiae Doidge, nov. nom.

Syn: *Englerulaster Popowiae* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) pp. 243, 279.

Englera Popowiae (Doidge) Stev., in Steven and Ryan, The Microthyriaceae (1939)
p. 45. [Plate IV.]

Colonies epiphyllous, scattered, thin, greyish black, more or less circular in outline, up to 7 mm. diam., occasionally numerous and confluent.

Mycelium radiating, becoming loosely reticulate. Hyphae at first isabella colour, becoming light brownish olive to brownish olive, 5-6.5 μ thick, straight or nearly so, rather obscurely septate; cells 20-35 μ long; branching irregular. Hyphopodia fairly numerous, alternate, unilateral or opposite, often very irregularly placed, 1-celled, erect, curved or bent, variable in form, cylindrical, ovate or subglobose, occasionally dilated suddenly near the base, rarely 2-celled, with a short, cylindrical basal cell, mostly 10-15 μ long, rarely longer, 6-10 μ broad. Mycelial setae fairly numerous, scattered, simple, straight, brownish olive, obscurely septate, becoming subopaque, up to 350 μ long, 5-6 μ thick at the base, tapering gradually to a blunt apex, which is 1.5-2 μ thick.

Thyriothecia numerous, scattered, usually discrete, but occasionally becoming confluent in small groups, 150-190 μ diam. Basal layer subhyaline, structure not evident. Covering membrane convex, at first light brownish olive, becoming darker and subopaque in the centre, formed of rather loosely compacted, irregularly radiating hyphae ca. 5 μ thick; margin coarsely and rather sparsely fimbriate; at maturity dehiscing by irregular fissures, which at first may be more or less radiating, the central cells finally falling away and exposing the developing asci. Asci 8-spored, ovate or subglobose, 40-47 \times 30-40 μ . Spores conglobate, oblong, brownish olive, broadly rounded at both ends, 1-septate, constricted, minutely verruculose at maturity, 21-27 \times 10-13 μ , cells subglobose, equal, or the upper slightly broader.

On *Popowia caffra* (Sond.) Hook. f. et Thoms, on leaves, Buccleuch near Cramond, *Doidge*, 9714 (Type); East London, *Doidge*, 10917; Stella Bush, Durban, *van der Byl* 322, 541, 11364, 32133 and *Schilz*, 14704; Bluff, Durban, *Morgan and Doidge*, 32166; Winter's Kloof, *Doidge*, 12434.

The covering membrane of the thyriothecia breaks up irregularly in the centre, but the cells do not seem to dissolve with free formation of mucilage and this is not a typical Englerulaster-form. The dehiscence of the thyriothecium resembles that of *Trichasterina Styrcis* (Th.) Arn., as figured by Arnaud (3, Pl. XXXIII); it also resembles this fungus in the presence of setae on the mycelium.

ASTERINA Lév.

Ann. Sc. Nat. Sér. 3, Bd. III (1845) p. 59.

Syn: *Dimerosporium* Fuckel (1869) in Symb. Myc. p. 89.

Myxasterina v. Höhn. (1909) in Fragm. Myk. No. 33.

Englerulaster v. Höhn. (1910) in Fragm. Myk. No. 520; cf. Theissen in Broteria (1914) p. 78.

Parasterina Theiss. et Syd. (1917) Ann. Myc. 15, p. 246.

Superficial mycelium usually well developed, with hyphopodia. Thyriothecia round, scutate, dimidiate; covering membrane radial, dehiscing by radiating cracks, or central part becoming mucilaginous and falling away. Hypothecium flat or slightly concave, colourless. Basal membrane present or absent. Hymenium simple, polyascous. Asci ovate to clavate, with or without typical paraphyses. Spores brown, 2-celled.

KEY TO SECTIONS.

A.—Typical paraphyses present; they are persistent filamentous, often subclavate at the tips.....

PARASTERINA
(Species 1–5)

B.—No typical paraphyses; paraphysoids sparse, or more or less freely developed, disappearing early or sub-persistent.

(a) Covering membrane of thyriothecium becoming strongly convex at maturity, cells dissolved with free formation of mucilage.....

ENGLERULASTER.
(Species 8–9)

(b) Covering membrane usually slightly convex, dehiscing by radiating stellate cracks.

1. Basal layer of thyriothecium subhyaline, without definite structure, not membranous.....

DIMEROSPORIUM.
(Species 10–37)

2. Thyriothecia with pale fuscous or greyish basal membrane, radiating in structure.....

CLYPEOLASTER.
(Species 38–53)

KEY TO SOUTH AFRICAN SPECIES OF ASTERINA.

I.—Typical paraphyses present.....Section

PARASTERINA.

A.—Hyphopodia 2-celled; spores zoned.....

1. *A. pemphidoides*.

B.—Hyphopodia 1-celled; spores not zoned.

(a) Spores smooth.

1. Hyphopodia very numerous, mostly opposite.....

2. *A. Oncinotidis*.

2. Hyphopodia less numerous, alternate.

x. Hyphae fringing thyriothecium tortuous.....

3. *A. Zeyheri*.

xx. Hyphae fringing thyriothecia straight or slightly undulating.

o. Spores $30-34 \times 12.5-15.5 \mu$

4. *A. natalitia*.

oo. Spores $27-31 \times 14-15 \mu$

5. *A. Oxyanthac*.

(b) Spores verruculose.

1. Hyphae all bearing hyphopodia.....

6. *A. Syzygii*.

2. Secondary hyphopodia without hyphopodia, paler.....

7. *A. Knysnae*.

II (a).—No typical paraphyses. Thyriothecium dehiscing by dissolution of cells of covering membrane.....Section

ENGLERULASTER.

A.—Spores $23-28 \times 12-15 \mu$

8. *A. nodosa*.

B.—Spores $33-39 \times 17.5-20 \mu$

9. *Bottomleyae*.

II (b) 1.—No typical paraphyses. Thyriothecium dehiscing by stellate cracks. No basal membrane.....Section

DIMEROSPORIUM.

A.—Hyphopodia continuous.

(a) Hyphopodia entire, or rarely sublobed.

1. Thyriothecia intercalary in origin.

x. Spores smooth.

o. Hyphopodia few, distant.

(i) Hyphopodia briefly cylindrical to subglobose.....

10. *A. secamonicola*.

(ii) Hyphopodia subglobose or conical.....

11. *A. inconspicua*.

(iii) Hyphopodia flattened hemispherical or ampulliform.

// Hyphopodia $3.5-4 \mu$ long; spores $9-10 \mu$ broad

12. *A. dissiliens*.

// Hyphopodia up to 10μ long; spores $11-11.5 \mu$ broad.....

12a. *A. dissiliens*,
var. *senegalensis*.

- oo. *Hyphopodia* fairly numerous.
- (i) Spores 35-42.5 μ long..... 13. *A. robusta*.
- (ii) Spores 25-29 μ long.
/ Hyphae 5-7 μ thick; hyphopodia broadly cylindrical..... 14. *A. opaca*.
// Hyphae 3-5.5 μ thick; hyphopodia pyriform.. 15. *A. Vepridis*.
- (iii) Spores 20-25 μ long.
/ Spores 12.5-15 μ broad..... 16. *A. Hendersoni*.
// Spores 10-12.5 μ broad.
' Hyphopodia subglobose to briefly cylindrical.
y. Immature spores not zoned..... 17. *A. ferruginosa*.
yy. Immature spores zoned..... 18. *A. Bosmanae*.
" Hyphopodia usually sublobed, irregular, often curved.
y. Hyphae 3-3.5 μ thick..... 19. *A. delicata*.
yy. Hyphae 3.5-4.5 μ thick..... 20a. *A. Greviae*,
var. *zonata*.
" Hyphopodia usually finger- or flask-shaped. 20. *A. Greviae*.
- xx. Spores verruculose.
o. Spores 16-20 \times 7.5-11 μ 21. *A. crotoniensis*.
oo. Spores 24-29 \times 13-15 μ 22. *A. Trichiliae*.
2. *Thyriothecia* terminal on short hyphal branches.
x. Spores verruculose..... 23. *A. Trichocladi*.
xx. Spores smooth, zoned..... 24. *A. rariopoda*.
- (b) *Hyphopodia* lobed.
1. *Thyriothecia* intercalary in origin.
x. Spores smooth.
o. Hyphopodia with shallow lobes or sublobed.
(i) Spores 14-16 \times 8-9 μ 25. *A. Pavoniae*.
(ii) Spores 20-25 \times 10-12.5 μ 20a. *A. Greviae*,
var. *zonata*.
2. *Thyriothecia* terminal on short hyphal branches.
x. Spores smooth.
o. Spores 11-13 μ long..... 26. *A. xumenensis*.
oo. Spores 13-15 μ long..... 27. *A. undulata*.
ooo. Spores 15-18 μ long..... 28. *A. Streptocarpi*.
xx. Spores verruculose..... 29. *A. gerbericola*.
- B. *Hyphopodia* septate.
(a) Spores smooth.
1. *Hyphopodia* few, 1-5-celled..... 30. *A. woodiana*.
2. *Hyphopodia* fairly numerous, mostly 2-celled.
x. Spores 29-34 \times 16-20 μ 31. *A. uncinata*.
xx. Spores 20-25 \times 9-11 μ .
o. *Hyphopodia* 6-10 μ broad..... 32. *A. reticulata*.
oo. *Hyphopodia* 3-4 μ broad..... 33. *A. Scolopinae*.
xxx. Spores 17.5-20 \times 8.5-11 μ 34. *A. Saniculae*.
- (b) Spores punctate or minutely verruculose.
1. Spores punctate..... 35. *A. fimbriata*.
2. Spores minutely verruculose..... 36. *A. Combreti*.
- (c) Spores grossly echinulate..... 37. *A. Peglerae*.
- II (b) 2.—No typical paraphyses. *Thyriothecia* dehiscing by stellate cracks.
Basal membrane present.....Section CLYPEOLASTER.
- A.—*Hyphopodia* continuous.
(a) *Hyphopodia* not lobed..... 38. *A. loranthicola*.
(b) *Hyphopodia* lobed.
1. Spores smooth.
x. *Thyriothecia* closely crowded; spores 14-18 \times 7.5-9 μ 39. *A. polythyria*.
xx. *Thyriothecia* scattered; spores 16-20 \times 9-10 μ 40. *A. clausenicola*.
2. Spores verruculose.
x. Spores 17-25 \times 10-12 μ , upper cell broader. Hyphae 3-5.5 μ thick..... 41. *A. erysiphoides*.
xx. Spores 17-20 \times 9-10 μ , upper cell broader. Hyphae 2.5-3.5 μ thick..... 43a. *A. diplocarpa*,
var. *Hibisci*.
xxx. Spores 16-18 \times 7.5-10 μ , cells subequal. Hyphae 3-4 μ thick 42. *A. tertia*,
var. *africana*.
xxxx. Spores 15-16.5 \times 7.5-9 μ , upper cell broader. Hyphae 3-5-4 μ thick..... 43. *A. diplocarpa*.
xxxxx. Spores 25-30 \times 12-14 μ 44. *A. Excoecariae*.
- B.—*Hyphopodia* septate.
(a) Spores smooth.
1. Spores 12-15 \times 5-6.5 μ 45. *A. Fleuryae*.

2. Spores 17.5–20 × 8.5–11 μ .
 x. Hyphopodia with cylindrical basal cell..... 46. *A. van der Bylii*.
 xx. Hyphopodia with gibbous basal cell..... 47. *A. peraffinis*.
 (b) Spores more or less verruculose-echinulate.
 1. Spores 16–20 μ long.
 x. Spores 7–9 μ broad, cells subequal..... 48. *A. radio-fissilis*.
 xx. Spores 8–10 μ broad, upper cell broader.
 o. Spores conspicuously verruculose-echinulate..... 49. *A. africana*.
 oo. Spores minutely verruculose-echinulate..... 49a. *A. africana*,
 var. *Kiggelariae*.
 2. Spores 22–30 μ long.
 x. Hyphopodia cylindrical, straight.
 o. Hyphopodia slender..... 50. *A. elegans*.
 oo. Hyphae broadly cylindrical..... 51. *A. capparidicola*.
 xx. Hyphopodia uncinata..... 52. *A. Woodii*.
 (c) Spores grossly verrucose. Hyphopodia lobed..... 53. *A. Rinorae*.

1. *Asterina pemphidioides* Cke

Grevillea V (1876) p. 16 ; Theissen, Die Gattung *Asterina* (1913) p. 40 (cum icones).

Syn. : *Parasterina pemphidioides* (Cke.) Theiss., Ann. Myc. XV (1917) p. 246 [Plate V.]

Colonies amphigenous, mostly hypophyllous, thin, greyish black, round to irregular in outline, not sharply defined, up to 8 mm. diam., scattered or more or less crowded, often becoming confluent and covering larger, irregular areas of the leaf surface.

Mycelium loosely reticulate, meshes of network usually quadrangular or triangular. Hyphae isabella colour to light brownish olive or bister, usually straight, sometimes more or less tortuous, 5–6 μ thick, occasionally up to 7 μ ; adjacent hyphae sometimes adhere and run parallel, forming strands of 2 or 3 hyphae; cells mostly 25–30 μ long; branching irregular. Hyphopodia distant, not very numerous, alternate or unilateral, 1-septate, straight or somewhat curved, cylindrical or subclavate, rounded at the apex, 12–17 μ long and 5–8 μ broad; basal cell short, usually cylindrical, rarely gibbous, 3.5–7 μ long and 5 μ broad; terminal cell ovate or cylindrical; 1-celled hyphopodia occasional, especially in the neighbourhood of the thyriothecia.

Thyriothecia more or less circular, occasionally broadly elliptic, 200–350 μ diam., less frequently up to 400 μ , scattered or gregarious and becoming confluent in groups of 2–4 and consequently flattened laterally by contact. Basal layer delicate, deep olive buff, formed of loosely radiating hyphae, not membranous. Covering membrane convex, bister and pellucid at the margin, becoming almost black and opaque in the centre, formed of irregularly radiating hyphae 3–5 μ thick, cells 7–10 μ long in the centre, 15–20 μ long near the margin where the hyphae become tortuous; margin crenate or more or less fimbriate; at maturity 3–5 radiating cracks develop, and the centre of the covering membrane later breaks away, exposing the developing asci. Asci not very numerous, ca. 10–15 in each thyriothecium, 8-spored, ovate, broadly rounded above and attenuate to the base, or broadly ellipsoid and rounded at both ends, 67.5–80 × 45–62.5 μ ; wall rather thin, thickened round the apex 5–10 μ . Paraphyses fairly numerous, hyaline, filiform, slightly exceeding the asci, 1.5–2 μ thick, slightly thickened, 3–4 μ , at the club-shaped tips and becoming conglutinate. Spores conglobate, oblong, rounded at both ends, 1-septate, slightly constricted, 32–40 μ long; upper cell broader and more broadly rounded, 16–20 μ long and 13–14 μ broad; lower 15–20 μ long and 11–12.5 μ broad; maturing spores are snuff brown with darker zones at each end and at either side of the septum, they are surrounded by a thin mucilaginous envelope ca. 1 μ thick; at maturity the spores are bister, and the zoning becomes very faint or not evident.

On *Syzygium Gerrardi* (Harv.) Hochst., Woodbush, Doidge, 17755, 28338; associated with *Asterina Syzygii*, on the same leaves.

The hyphae and spores of this fungus are more slender than described by Theissen for the species, but agree in measurements with specimens distributed by Sydow under this name and others identified by him. (Syd. Fung. exot. 270, 271 and Phil. Bur. Sci. 20924, 8378 and 23892.)

2. *Asterina Oncinotidis* Doidge nov. nom.

Syn. : *Parasterina rigida* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) pp. 246, 277; not *Asterina rigida* Doidge. [Plate VI.]

Colonies epiphyllous, black, or more or less circular, scattered, mostly on the primary veins, up to 7 mm. diam.

Mycelium rather closely reticulate. **Hyphae** sayal brown to verona brown, more or less sinuous and uneven in thickness, 5-7.5 μ thick; cells mostly 15-20 μ long; branches usually alternate. **Hyphopodia** very numerous, opposite or alternate, sometimes 3 arise from one hyphal cell and are irregularly placed, when there are two to one cell they are not always exactly opposite; 1-celled, ovate or briefly cylindrical, broadly rounded above, erect and symmetrical or oblique, often flattened through pressure of neighbouring hyphae or hyphopodia, 6-8 μ long, rarely up to 10 μ , 5-7 μ broad.

Thyriothecia crowded, circular in outline, 300-400 μ diam., often fusing laterally in groups of 2-4 and forming larger, irregular ascomata. Basal layer delicate, structure not evident. Covering membrane slightly convex, brownish black, opaque in the centre, more or less pellucid at the margin; margin briefly fimbriate, and composed of radiating hyphae 4-5 μ thick; dehiscing at maturity by more or less irregularly radiating cracks and by an irregular disruption of the central cells. **Asci** numerous, broadly ellipsoid to ovate, sessile, 60-75 \times 30-40 μ , somewhat thickened round the apex. **Spores** conglobate, oblong, broadly rounded at both ends, 1-septate, constricted, smooth, sayal brown, 27-33 \times 13-15 μ ; upper cell somewhat larger than the lower. **Paraphyses** filiform, somewhat swollen at the tips, not exceeding the asci or slightly so.

On *Oncinotis inandensis* Wood and Evans, Buccleuch, Natal, *Doidge* 9722, Type; Inanda, *Medley Wood 1009* (Type specimen of host in Natal Herbarium) 32173.

3. *Asterina Zeyheri* Doidge nov. spec. [Plate VII.]

Colonies epiphyllous, dense black, more or less circular in outline, up to 5 mm. diam.

Mycelium radiating, becoming more or less reticulate. **Hyphae** dresden brown to mummy brown, straight or slightly undulating, 5-6 μ thick, occasionally up to 7.5 μ thick; cells mostly 20-30 μ long; branches fairly numerous, irregular. **Hyphopodia** rather numerous, unilateral or alternate, briefly cylindrical or ovate, 7.5-15 μ long and 7.5-9 μ broad.

Thyriothecia more or less closely crowded, discrete and circular in outline, or fusing laterally in groups of 2-4 or more and forming larger compound ascomata; single thyriothecia 250-350 μ diam. Basal layer delicate, subhyaline, structure not evident. Covering membrane convex, brownish black and opaque in the centre; radiating hyphae visible in the rather broad, pellucid margin are paler than the mycelial hyphae, more or less tortuous, 3-5 μ thick; margin crenate to subfimbriate, groups of hyphae running out and fusing with the mycelial hyphae; dehiscing at maturity by irregularly stellate fissures or quite irregularly. **Asci** numerous, ovate or broadly ellipsoid, 8-spored, sessile, 67.5-80 \times 40-45 μ , with a firm, thick wall, 1-1.25 μ thick, thickened round the apex (5-7.5 μ). **Spores** conglobate, oblong, broadly rounded at both ends, 1-septate, deeply constricted, smooth, dresden brown to mummy brown, 30-39 μ long; cells subglobose, upper slightly larger, 15-20 μ long and 14-16 μ broad, lower 14-19 μ long and 12.5-15 μ broad. **Paraphyses** numerous, hyaline, filiform, exceeding the asci, about 1 μ thick.

On *Eugenia Zeyheri* Harv., on leaves, Van Staden's Pass, *Doidge* 10873; Howieson's Poort, near Grahamstown, *Doidge*, 12377; Alexandria, *Doidge*, 22357, Type.

4. *Asterina natalitia* Doidge nov. spec. [Plate VIII.]

Colonies epiphyllous, thin, greyish black, not sharply defined, round to irregular in outline, up to 5 mm. diam.

Mycelium radiating, becoming very loosely reticulate. **Hyphae** dark olive buff to buffy brown, straight or very slightly undulating mostly 4-5 μ thick in places up to 6 μ ; cells mostly 22-30 μ long; branching remote irregular, sometimes opposite. **Hyphopodia** alternate or unilateral, occasionally opposite, fairly numerous, usually one to each hyphal cell, continuous, cylindrical, rarely ovate or irregular, mostly straight, 7.5-13 μ long, 5-6.5 μ broad.

Thyriothecia scattered or confluent in small groups of 2-4, more or less circular in outline, 200-300 μ diam. Basal layer delicate, subhyaline, structure not evident. Covering membrane convex, opaque blackish brown in the centre, pellucid and deep to dark olive buff near the fimbriate margin, formed of radiating hyphae 2.5-3 μ thick, breaking down irregularly at maturity. **Asci** fairly numerous, ca. 20 in each thyriothecium, 8-spored, ovate or ellipsoid, sessile, 50-65 \times 35-42.5 μ , with a firm wall. **Spores** conglobate, buffy brown, oblong, rounded at both ends, 1-septate, rather deeply constricted, smooth 30-34 μ long; upper cell broadly ellipsoid, 16-17.5 μ long and 12.5-15 μ broad, lower cylindrical to ovate, 15-16 μ long and 10-12.5 μ broad, separating rather readily at the septum.

Paraphyses numerous, filiform, $1.5-2.5\ \mu$ thick, hyaline or tinged chlorine yellow, exceeding the asci, slightly swollen and club-shaped at the tips, up to $5\ \mu$ thick and becoming conglutinate.

On *Eugenia natalitia* Sond., on leaves, Woodbush, Doidge, 17751, Type.

On *Eugenia zuluensis* Dümmer, Xumeni Forest, near Donnybrook, Doidge, 28958, 29837, 29899, 32235; Zwartkop, near Pietermaritzburg, Doidge, 12438, 11597; Krantzklouf, Doidge, 8984; Umzinto Bush, Wager, 32683.

Material of this fungus is scarce, although abundant collections of *Eugenia zuluensis* have been made; colonies of the *Asterina* are comparatively few on these leaves, and are associated with those of several other fungi, including *Irene atra* and *Meliola cylindripoda*.

5. *Asterina Oxyanthi* Doidge nov. nom.

Syn.: *Parasterina laxa* Doidge, Bothalia I (1924) p. 201; not *Asterina laxa* Wint.

Parasterina brachystoma (Rehm.) Th. var. *laxa* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) p. 201. [Plate IX.]

Colonies epiphyllous, black, scattered, round to irregular in outline, up to 5 mm. diam., more or less crowded and becoming confluent.

Mycelium laxly or more closely reticulate, forming a network with quadrangular or triangular meshes. Hyphae tawny olive to warm sepia, straight, $6-7.5\ \mu$ thick, or occasionally up to $8\ \mu$ thick; cells mostly $20-23\ \mu$ long; branches irregular, alternate or opposite. Hyphopodia fairly numerous, alternate or unilateral, 1-celled, briefly cylindrical or ovate, broadly rounded above, $7.5-9\ \mu$ long, $7.5-9\ \mu$ or occasionally up to $10\ \mu$ broad; the majority are erect, at right angles to the hyphae.

Thyriothecia crowded, circular in outline, $250-400\ \mu$ diam., or fusing laterally in groups of 2-4 or more and forming larger, irregular, compound ascomata. Basal layer delicate, hyaline, structure not evident. Covering membrane convex, blackish brown and opaque in the centre, with a narrow pellucid margin, composed of radiating hyphae $3-4\ \mu$ thick; structure obscure in the centre, which breaks down irregularly at maturity; margin fimbriate. Asci numerous, $20-30$ in each thyriothecium, 8-spored, ovate or broadly ellipsoid, sessile, $60-75 \times 40-50\ \mu$, with a firm, thick wall, $1-1.5\ \mu$ thick, thickened round the apex, up to $10\ \mu$. Spores conglobate, snuff brown, oblong, broadly rounded at both ends, 1-septate, deeply constricted, smooth, $27-31\ \mu$ long; cells subglobose, upper slightly larger, $14-15\ \mu$ long and $14-15\ \mu$ broad, lower $14-15\ \mu$ long and $12.5-14\ \mu$ broad. Paraphyses hyaline or with a yellowish tinge, numerous, filiform, $2.5-3\ \mu$ thick.

On *Oxyanthus Gerrardi* Sond., on leaves, Woodbush, Doidge, 1758, Type, 28326 and van der Byl 1534; Berea, Durban, van der Byl 111, 741, 11017, 11366.

6. *Asterina Syzygii* Doidge nov. spec.

Sub *Parasterina brachystoma* (Rehm.) Th. in Trans. Roy. Soc. S. Afr. 8 (1920) p. 245. Plate X.

Colonies amphigenous, mostly epiphyllous, black, crustaceous, more or less circular in outline, usually up to 5 mm. diam., less frequently up to 10 mm.

Mycelium stout, verona brown to warm sepia, irregularly reticulate. Hyphae radiating, straight or more or less tortuous, $6-8\ \mu$ thick, closely septate; cells $10-16\ \mu$ long, walls often oblique; branches numerous, irregular. Hyphopodia fairly numerous, alternate or unilateral, briefly cylindrical, ovate or subglobose, $7-12.5\ \mu$ long and $7-10\ \mu$ broad, at right angles to the hyphae or more or less oblique.

Thyriothecia rather numerous, scattered or more or less crowded, not infrequently developing in irregular, concentric rings round the centre of the colony, discrete and circular in outline, crowded and becoming flattened laterally by contact, or less frequently becoming completely fused and forming larger, compound ascomata. Single thyriothecia $250-350\ \mu$ diam., rarely up to $400\ \mu$. Basal layer subhyaline, delicate, structure not evident. Covering membrane slightly convex, almost black and opaque in the centre, tawny olive, often paler than the mycelium at the margin, firmly compacted, formed of radiating hyphae $3-5\ \mu$ thick, which are usually somewhat tortuous near the margin; margin irregular, subfimbriate, a few hyphae, or groups of hyphae running out and fusing with the mycelial hyphae; breaking into several triangular segments at maturity, by radiating stellate fissures. Asci numerous, more than 30 in each thyriothecium, 6-8-spored, broadly ellipsoid to ovate, sessile, $60-75 \times 37.5-45\ \mu$, with a firm, stout wall $2-2.5\ \mu$ thick, slightly thickened round the apex, $7-9\ \mu$. Spores oblong, broadly rounded at both ends, 1-septate, very slightly

constricted, warm sepia, finely and very closely verruculose, $27.5-35 \times 14-17 \mu$; cells equal in length, upper usually very slightly broader; roughness of the epispore visible even in immature, hyaline spores in the ascus. Paraphyses numerous, filiform, hyaline or tinged chlorine yellow, septate, $2-2.5 \mu$ thick, swollen or clavate at the tips and $3.5-4 \mu$ thick, slightly exceeding the asci and becoming conglutinate.

On *Syzygium Gerrardi* (Harv.) Hochst., Woodbush, Gray, 888, Doidge, 1759, 17755, Type, and 28337, van der Byl 1514, 1523; Buccleuch, near Cramond, Natal, Doidge, 9723 and Sim, 10141; Entabeni, N. Transvaal, Bosman, 26113; Winter's Kloof, Natal, Doidge, 12439.

This fungus, which is usually heavily parasitised, appears to be limited to *Syzygium Gerrardi*; it is closely related to *Asterina brachystoma*, but not identical with that species, from which it differs in the larger thyriothecia, verruculose spores and other details. It is associated with *Asterina pemphidioides* in No. 28337.

7. *Asterina Knysnae* Doidge nov. spec. [Plate XI.]

Colonies amphigenous, more or less circular in outline, up to 5 mm. diam., or, if on the under surface, with a tendency to become elongated along veins and leaf margins, scattered or becoming confluent, thin, greyish black, not sharply defined.

Mycelium loosely reticulate, meshes angular. Main hyphae olive brown, straight or slightly tortuous, $6-7.5 \mu$ thick, cells mostly $25-30 \mu$ long, branching irregular. Hyphopodia unilateral or alternate, rarely opposite, numerous, continuous, cylindrical to pyriform, erect, oblique or appressed to the hyphae, straight, curved or bent, $10-15 \mu$ long and $8-10 \mu$ broad. Branches or secondary hyphae paler, dark olive buff to olive brown, $3.5-5 \mu$ thick and devoid of hyphopodia or almost so.

Thyriothecia scattered or grouped, occasionally becoming confluent, round or somewhat irregular in outline, $120-150 \mu$ diam. Basal layer subhyaline, delicate, structure not evident. Covering membrane slightly convex, formed of radiating hyphae $2.5-4 \mu$ thick, opaque in the centre and structure obscure, pellucid, pale olive brown near the fimbriate margin; dehiscing irregularly at maturity, the centre of the covering membrane finally falling away and leaving only the fimbriate margin; fringing hyphae $3-4 \mu$ thick, radiating, more or less straight, deep to dark olive buff. Asci few, up to 10 in each thyriothecium, 8-spored, subglobose to ovate, sessile, $50-57.5 \times 40-50 \mu$, with a firm thick wall, $1-1.5 \mu$ thick, thickened round the apex, up to 7.5μ . Spores conglobate, buffy brown to olive brown, oblong, rounded at both ends, 1-septate, constricted, minutely and closely verruculose, $30-35 \mu$ long; cells subglobose, upper larger, $16-20 \mu$ long and $16-17.5 \mu$ broad, lower $14-15 \mu$ diam. Paraphyses hyaline, filiform, $1.5-2 \mu$ thick.

On *Canthium ciliatum* O.Kze., on leaves, Deepwalls, Knysna, Doidge, 17226.

8. *Asterina nodosa* Doidge nov. spec. [Plate XII.]

Colonies epiphyllous, scattered, black, more or less circular in outline, up to 5 mm. diam.

Mycelium reticulate, forming a rather open network with angular meshes. Main hyphae cinnamon brown to Prout's brown, irregularly bent and curved, often gnarled and subtorulose, $3.75-7.5 \mu$ thick, mostly $5-6 \mu$ thick, secondary hyphae usually paler and not more than 5μ thick; rather closely septate, cells mostly $15-20 \mu$ long; branching irregular. Hyphopodia fairly numerous, alternate or unilateral, continuous, very variable in form, often more or less cylindrical, rarely straight, bent or variously curved, often irregularly and obtusely sublobed, $7-12.5 \mu$ long, $6-10 \mu$ broad; rarely 2-celled and then up to 17.5μ long with basal cell cylindrical or tapering downwards and ca. 10μ long.

Thyriothecia numerous, scattered, usually discrete, occasionally confluent in small groups of 2-3, more or less circular in outline, $100-150 \mu$ diam. Basal layer subhyaline, delicate, structure not evident. Covering membrane becoming strongly convex, blackish brown and opaque at maturity, composed of irregularly radiating hyphae, $2.5-4 \mu$ thick, cells mostly $5-10 \mu$ long; surrounded at the margin by a more or less ragged fringe of paler, tortuous and torulose hyphae, which are cinnamon buff to tawny, $2.5-4 \mu$ thick; at maturity the central cells fall away, exposing the asci, which are embedded in a brownish, mucilaginous mass, radiating cracks develop towards the margin. Asci not very numerous, 8-spored, subglobose to broadly ovate, broadly rounded above, sessile, $37-45 \times 35-40 \mu$; wall rather delicate, readily rupturing and setting the spores free. Spores conglobate, oblong, broadly rounded at both ends, almost equally 1-septate, rather deeply constricted, snuff brown to cinnamon brown, finely and rather remotely verruculose-echinulate, $23-28 \mu$ long; cells subglobose, upper $12-15 \mu$, lower $11-12.5 \mu$ broad.

On *Ilex mitis* (L.) Radlk., Woodville Forest, George, Doidge, 10943.

This fungus is related to *Englerulaster orbicularis* (B. et C.) v. Höhn., to which it is similar in habit, but from which it differs in the size of the spores. It is associated with *Asterina Hendersoni* and *A. Bottomleyae* on the same leaves, and a few colonies have been observed in other collections of these fungi on *Ilex mitis*.

9. *Asterina Bottomleyae* Doidge nov. spec. [Plate XIII.]

Colonies amphigenous, mostly epiphyllous, numerous, scattered, dense black, more or less circular, up to 5 mm. diam.; often very numerous and covering a large part of the upper surface of the leaf.

Mycelium radiating. Hyphae straight or slightly sinuous, buckthorn brown to dresden brown, 6.5–7.5 μ thick, closely septate, cells 15–25 μ long; branches usually opposite and emerging at an angle of about 45°. Hyphopodia numerous, mostly opposite, in places unilateral or alternate, mostly erect and almost at right angles to the hyphae, briefly cylindrical and broadly rounded above, or more or less pyriform and narrowing rather suddenly near the apex, continuous, 10–14 μ long and 6.5–7.5 μ broad.

Thyriothecia very numerous, more or less circular in outline, 120–160 μ or up to 200 μ diam.; often closely crowded and in many cases forming an irregular circle round the centre of the colony. Basal layer subhyaline, delicate, structure not evident. Covering membrane at first buckthorn brown, slightly convex, pellucid, becoming strongly convex and opaque black as it approaches maturity, composed of radiating hyphae, which, near the margin are more or less tortuous and ca. 5 μ thick; the margin is more or less fimbriate, with a fringe of paler tortuous hyphae, but when the thyriothecia are mature, this is more or less concealed by the swollen central portion which has become subglobose; walls of the central cells dissolving at maturity, completely disappearing and exposing the asci. Asci not very numerous, up to 10 in each thyriothecium, 4–8-spored, ovate to subglobose, sessile, 65–80 \times 58–60 μ , with a firm wall slightly thickened round the apex. Spores conglobate, oblong, broadly rounded at both ends, 1-septate, deeply constricted, at first hyaline to buckthorn brown and smooth, when quite mature, dresden brown, minutely and closely verruculose, 33–39 μ long; cells subglobose, upper 17.5–20 μ diam., lower 15–19 μ .

On *Ilex mitis* (L.) Radlk., on leaves, Mont-aux-Sources, Natal, Bottomley, 23406, Type; Woodbush, Doidge, 1753, 17780; Brander's High Forest, Victoria East, van der Byl, 9461; Buccleuch, Natal, Doidge, 11563; Woodville Forest, George, Doidge, 10943a; Klein Kruis Rivier, Riversdale, Muir 3452, 32375; between Vryheid and Nongomo, Pole Evans, 32373; Graskop, Galpin, 32370; Knysna, Laughton, 32468.

This fungus is often associated with *Asterina Hendersoni*, which occurs on the same leaves.

10. *Asterina secamonicola* Doidge.

Bothalia II (1927) p. 233. [Plate XIV.]

Colonies epiphyllous, thin, greyish black, more or less circular in outline, up to 6 mm. diam.; often numerous, becoming confluent and covering the greater part of the leaf surface.

Mycelium closely reticulate, meshes of network angular. Hyphae isabella colour, 3.5–4 μ thick, straight or slightly sinuous, rather closely septate, cells mostly 15–20 μ long; branching very freely and irregularly, especially in the vicinity of the hyphopodia and early producing a close network. Hyphopodia not at all numerous, usually only on the main hyphae and not readily distinguishable in the older parts of the mycelium; usually distant, solitary, unilateral or alternate, occasionally two develop on the same side of the hypha from the same cell; hyphopodia continuous, very briefly cylindrical, subglobose or flattened obliquely, somewhat darker than the hyphae, 6.5–12 μ long, 6.5–8 μ broad, rarely up to 10 μ broad.

Thyriothecia numerous, scattered, more or less circular in outline, 180–240 μ diam., usually discrete, occasionally becoming confluent. Basal layer hyaline, delicate, structure not evident. Covering membrane slightly convex, at first isabella colour, rapidly becoming darker, subopaque, firmly compacted and formed of radiating hyphae 3–3.5 μ thick; pellucid near the margin, which is entire or briefly fimbriate; at first closed, splitting at maturity, through stellate fissures, into a few broad, triangular segments, central cells later breaking down irregularly. Asci rather numerous, 20–30 in each thyriothecium, 8-spored, subglobose, broadly rounded above, sessile, 30–32 \times 27–30 μ or oblong-ovate, 40–50 \times 24–27 μ ; with a firm, thick wall, which is slightly thickened, up to 5 μ , round the apex. Spores conglobate, oblong, rounded at both ends, 1-septate, constricted, snuff

brown, smooth, 20–23.5 μ long; cells oval, upper 9–10 μ broad, lower 6.5–7.5 μ broad. Paraphysoids hyaline, filamentous; breaking down early and producing the yellowish-brown, mucilaginous mass in which the asci are embedded.

On *Secamone alpini* Schultes, on leaves, Woodbush, Doidge, 17716.

11. *Asterina inconspicua* Doidge nov. comb.

Syn.: *Asteromyxa inconspicua* Doidge, Bothalia 1 (1924) 199. [Plate XV.]

Colonies epiphyllous, scattered, minute, thin, inconspicuous, brownish black, round to irregular in outline.

Mycelium radiating, main hyphae often running closely parallel and forming strands of 2–4 hyphae; becoming loosely reticulate. Hyphae dark olive buff to buffy brown, mostly 2.5–4 μ thick, in places up to 5 μ , almost straight or more or less undulating; cells mostly 20–25 μ long; branching irregular. Hyphopodia few, distant, hemispherical to conoid, sometimes broader than long, 5–9.5 μ long, 5–7.5 μ broad, somewhat darker than the hyphae.

Thyriothecia fairly numerous; there is usually a group of 2–5 closely crowded in the centre of the colony, elsewhere they are scattered; single thyriothecia more or less circular in outline or becoming angular through lateral pressure, 150–200 μ diam. Basal layer hyaline, inconspicuous. Covering membrane slightly convex, buffy brown, becoming almost black and quite opaque, formed of somewhat undulating, radiating hyphae 2.5–4 μ thick, cells mostly 4–5 μ long, margin somewhat irregular but not fimbriate: at maturity developing more or less radiating or irregular cracks, the central cells finally falling apart and disappearing. Asci 8-spored, at first ovate or oblong-ovate, 30–35 \times 22–24 μ , when mature often becoming more elongated; disappearing early and leaving groups of spores embedded in dirty brown, mucilaginous matter, probably formed through the early break-down of paraphysoids. Spores conglobate, oblong, rounded at both ends, 1-septate, rather deeply constricted, dark olive buff, smooth, 17–22 μ long; upper cell larger, 10–13 μ long and 8–8.5 μ broad, lower 8–9 μ long and 6.5–8 μ broad.

On *Chilianthus arboreus* A DC., on leaves, Van Staden's Pass, Doidge, 17252, Type; Belmont Valley, Grahamstown, Britten, 22342.

This species is closely related to *Asterina dissiliens*, *A. secamonicola*, *Lembosia piriensis* and *L. durbanensis*. The five fungi seem to form a natural group, although the two *Lembosia* spp. differ in the shape of the thyriothecia. They are similar in habit, have few and distant hyphopodia, a tendency to mucilage formation and dissolution of central cells of the covering membrane (in this approaching *Englerulaster* and *Asteromyxa*) and spores of similar form which germinate in the region of the septum.

At the tips of hyphal branches, especially in the younger parts of the colony, ellipsoid or ovoid swellings are sometimes observed; these are non-septate. These bodies were called conidia in the original description (Doidge l.c.) but this is apparently incorrect. Similar bodies are to be found on the mycelium of *Asterina dissiliens* and *A. secamonicola*.

12. *Asterina dissiliens* (Syd.) Doidge nov. comb.

Syn.: *Parasterina reticulata* Doidge, Bothalia 1 (1924) p. 200, not *Asterina reticulata* (Kalch. et Cke.) Doidge.

Asterinella dissiliens Syd., Ann. Myc. 22 (1924) p. 425. [Plate XVI.]

Colonies amphigenous, chiefly epiphyllous, thin, greyish black, more or less circular in outline, 4–10 mm. diam.; frequently numerous, especially on the upper side, becoming confluent and covering a large part of the leaf surface.

Mycelium more or less closely reticulate; meshes of network usually irregularly quadrilateral or triangular. Primary hyphae isabella colour, straight or more or less undulating, usually radiating from the centre of the colony like the spokes of a wheel, 3–4 μ thick, cells mostly 15–25 μ long, branching freely and irregularly; hyphal branches, early forming a more or less close network between the main hyphae, are somewhat paler. Hyphopodia not very numerous, only on the main hyphae, unilateral or alternate, usually distant, continuous, flattened hemispherical or prostrate ampulliform, occasionally sublobed, usually broader than long, rarely suberect, usually 3.5–4 μ long and 8–13 μ broad, somewhat darker than the hyphae.

Thyriothecia numerous, scattered, often rather crowded near the centre of the colony and occasionally confluent, circular in outline, 120–250 μ diam. Basal layer delicate, hyaline, structure not evident. Covering membrane slightly convex, opaque and blackish brown in

the centre, pellucid at the fimbriate margin; fringing hyphae ca. 3μ thick, fusing with the mycelial network; at first closed, then breaking into a few triangular segments through the formation of stellate fissures, the central part finally falling away and exposing the asci. Asci numerous, 8-spored, at first ovate or oblong-ovate, $40-55 \times 25-35\mu$, at maturity often becoming more elongated, cylindrical or clavate, and then up to 75μ long and $18-22\mu$ broad, sessile, slightly thickened round the apex. Spores conglobate in the ovate asci, obliquely monostichous or distichous in the elongated asci, snuff brown, ellipsoid, rounded at both ends, 1-septate, deeply constricted, $20-25\mu$ long; cells ovate or subglobose, upper usually larger, $11-13.5\mu$ long and $9-10\mu$ broad, lower $10-11.5\mu$ long and $7.5-9\mu$ broad; germinating near the septum. Paraphysoids filiform, numerous, subpersistent, finally breaking down into the yellowish brown mucilaginous mass in which the asci are embedded.

On *Cassine papillosa* O. Kze., on leaves, Knysna, van der Byl 1361, Type; Kentani, Pegler, 2253; Woodville Forest, George, Doidge, 10941; Deepwalls, Knysna, J. Phillips, (van der Byl 2220), 20383.

Gymnosporia buxifolia Szysz., near Durban, Medley Wood 6452, 337, 9500, 9518; East London, Doidge, 10913; Empangeni, van der Byl, 11367; Alexandria, Doidge, 22404; Knysna, Bottomley, 31014, 32115, 32242; Umhlanga Rocks, Wager 56, 32 82; Zululand, van der Byl 321; Groot Rivier, Knysna, van der Byl 2296; East London, Bartel (van der Byl 2430).

Gymnosporia harveyana Loesen, Claridge, Natal, Doidge, 8997; Woodbush, Doidge 17711.

Gymnosporia nemorosa E. & Z., Knysna, Pienaar, 2429; Umgeni, near Durban, Medley Wood, 9023; Kentani, Pegler 2336, 9069; Port Elizabeth, Bottomley, 9558; Lovedale Institute, Alice, Doidge, 10974; Langholm Estates, Bathurst, Doidge, 12370; Howieson's Poort, Grahamstown, Doidge, 12386; van Staden's Pass, Doidge, 17262; Empangeni, McClean, 31077; Knysna, van der Byl 2304.

Gymnosporia sp., Groot Rivier, Knysna, van der Byl 1392.

Pleurostyla capensis Oliv., Kentani, Pegler, 2532.

Putterlickia pyracantha Endl., Amanzi, near Uitenhage, Doidge, 22406.

Putterlickia verrucosa Szysz., Kentani, Pegler, 8782; Winkle Spruit, Doidge, 9007; Umgeni, near Durban, Medley Wood, 9033; Pirie Forest, Kingwilliamstown, Doidge, 12286, 12330; East London, Doidge, 12407; Alexandria, Doidge, 22405.

Asterinella dissiliens Syd. is the same fungus as that described as *Parasterina reticulata*; the type collection, van der Byl 1361, is identical with collections on Celastraceae made elsewhere. Hyphopodia are present on the mycelium of the type, but are few and inconspicuous. The type is on *Cassine papillosa*, not *Cassine croceum* (= *Eleaodendron croceum*) as originally stated.

An unfortunate error was made in indicating No. 11725 on *Gymnosporia senegalensis* as the type specimen of *Parasterina reticulata* (Doidge, loc. cit.). The original description and drawing were made from No. 9069 on *Gymnosporia nemorosa*, which must be regarded as the type. The two collections on *G. senegalensis* vary decidedly from the type and are regarded as a distinct variety.

Asterina dissiliens is a very common and widespread species on a number of plants belonging to the family Celastraceae; it should not be confused with *Asterina reticulata* (K. & Cke.) Doidge, which occurs on Oliniaceae and has 2-celled hyphopodia. (See Stevens and Ryan, 32, p. 64.)

12a. *Asterina dissiliens* (Syd.) Doidge, var. *senegalensis* Doidge nov. var.

Mycelium closely reticulate, formed of strongly undulating hyphae $4-5\mu$ thick; hyphopodia hemispherical to ovate or ampulliform, more frequently erect than in the type, up to 10μ long and 10μ broad. Spores oblong, 1-septate, deeply constricted, $20-23.5\mu$ long; cells subglobose or ovate, upper $11-11.5\mu$ diam., lower $9-10\mu$.

On *Gymnosporia senegalensis* Loes., on leaves, Nelspruit, van der Byl, 7076; Rikatli, Mozambique, Junod, 11725; Nelspruit, Liebenberg, 29907; Sabie, Wager, 32413.

13. *Asterina robusta* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 256, 277.

Syn.: *Parasterina implicata* Doidge, loc. cit., pp. 244, 275.

[Plate XVII.]

Colonies mostly epiphyllous, a few occasionally on the under side of the leaf, round to irregular in outline, black, crustaceous, $3-5$ mm. diam., often numerous and confluent; leaf tissues under the fungus sometimes discoloured to a light brown.

Mycelium radiating, becoming loosely or closely reticulate, meshes of network mostly angular. Hyphae ochraceous tawny to cinnamon brown, straight or more or less tortuous, variable in thickness, somewhat torulose in places, 5–7 μ thick, sometimes up to 9 or 10 μ thick, briefly articulate, cells 14–25 μ long; branches very numerous, irregular, often opposite, usually somewhat narrowed at the junction with the main hyphae, tips of branches often somewhat club-shaped. Hyphopodia not very numerous, unilateral or alternate, 1-celled, hemispherical, briefly cylindrical, ovate or slightly flattened, 6–10 μ long, 6.5–7 μ or up to 10 μ broad.

Thyriothecia usually crowded near the centre of the colony, round, 300–400 μ diam., often fused in small groups of 2–4 or more, thus forming larger, irregular, compound ascomata. Basal layer delicate, subhyaline, structure not evident. Covering membrane convex, opaque, cinnamon brown to almost black in the centre, clay colour to ochraceous tawny and pellucid near the margin, very firmly compacted, composed of radiating, somewhat undulating hyphae, 3.5–5 μ thick; cells 15–25 μ long near the margin, septation in the centre not readily discernible; margin not fimbriate, but radiating hyphae composing the covering membrane often fuse at the margin with the mycelial network; rupturing at maturity into a number of triangular segments by radiating stellate cracks, or breaking down irregularly. Asci numerous, ca. 20 in each thyriothecium, ovate to subglobose, broadly rounded above, sessile, 8-spored, with a firm, thick wall, 62–82.5 \times 50–70 μ . Paraphysoids numerous, at first hyaline, rather stout, 2–4 μ thick, septate, more or less tortuous or torulose, subpersistent; becoming tinged pale olive yellow as the asci approach maturity and finally breaking down into a dirty yellow or ochraceous mucilaginous mass. Spores conglobate, cinnamon brown, ellipsoid-oblong, broadly rounded at both ends, 1-septate, rather deeply constricted, smooth, 35–42.5 \times 17–20 μ ; cells ovoid to subglobose, equal, or the upper slightly broader.

On *Sideroxylon inerme* L., on leaves, Mossel Bay, *Pole Evans*, 9066, Type; East London, *Doidge*, 10922 (Type of *Parasterina implicata*); Langholm Estates, Bathurst, *Doidge*, 12357; Kowie, *Britten*, 14221.

Parasterina implicata was described from material not fully mature, and the host was wrongly identified; there can be no doubt that it is the same fungus as *Asterina robusta*.

14. *Asterina opaca* Syd.

Ann. Myc. 10 (1912) p. 3; Theiss., Die Gattung *Asterina* (1913) p. 113; *Doidge*, Trans. Roy. Soc. S. Afr. 8 (1920) p. 255. [Plate XVIII.]

Colonies epiphyllous, round, dense black, 1–3 mm. diam., scattered.

Mycelium more or less closely reticulate, stout. Hyphae straight, snuff brown to bister, 5–7 μ thick, thick-walled, walls ca. 1 μ thick; cells mostly 10–15 μ long; branches numerous, usually alternate. Hyphopodia numerous, opposite or alternate, 1-celled, briefly cylindrical or subpyriform, broadly rounded at the apex or more or less attenuate, 8–11 μ long, 5–6 μ broad.

Thyriothecia often only 1 or 2 in each colony, but as many as 10 in the larger colonies, round, 150–250 μ diam. Basal layer subhyaline, delicate, structure not evident. Covering membrane convex, opaque, bister to black, structure only evident after prolonged exposure to the action of a bleaching agent, composed of irregularly radiating hyphae, mostly 4–5 μ thick but in places up to 7.5 μ thick; central cells 5–7.5 μ long, those near the margin 20–25 μ long; somewhat fimbriate at the margin, fringing hyphae straight or nearly so, at times somewhat torulose, rigid, snuff brown, 4–5 μ thick and up to ca. 50 μ long; dehiscing by irregularly radiating fissures. Asci numerous, ovate to globose, 8-spored, with a firm wall somewhat thickened at the apex, 50–70 \times 35–46 μ , embedded in a mass of ochraceous, mucilaginous matter. Spores conglobate, oblong, broadly rounded at both ends, 1-septate, deeply constricted, bister, smooth, 26–28 \times 13–14 μ ; cells equal, or the upper slightly broader.

On *Chrysophyllum natalensis* Sond., Amanzimtoti, Natal, *Doidge*, 1664, Type; Buccleuch, Natal, *Doidge*, 11555.

15. *Asterina Vepriidis* *Doidge* nov. spec. [Plate XIX.]

Colonies amphigenous, thin, greyish black, effuse, not sharply defined, more or less circular and up to 3 mm. diam., or spreading somewhat along the veins and leaf margins.

Mycelium loosely reticulate, network with angular meshes. Hyphae radiating, tawny olive to snuff brown, straight or nearly so, 3.5–5 μ thick, cells mostly 15–20 μ long; branches rather distant, usually opposite and emerging at an angle of about 45° with the main hyphae.

Hyphopodia numerous, opposite, alternate or unilateral, 1-celled, pyriform or flask-shaped, straight, slightly curved or gibbous, $7.5\text{--}11\ \mu$ long, $4\text{--}5\ \mu$ thick at the base, tapering more or less gradually into a short neck.

Thyriothecia numerous, crowded in the centre of the colony, rarely scattered, frequently fused in groups of 2-4 or many and forming large or small, irregular, compound ascomata. Single thyriothecia round, $160\text{--}200\ \mu$ diam. Basal layer delicate, hyaline, structure not evident. Covering membrane convex, snuff brown, becoming opaque in the centre, formed of straight, radiating hyphae $3\text{--}4\ \mu$ thick; central cell almost cubical, $3\text{--}5\ \mu$ long, up to $8\ \mu$ long near the margin, which is avellaneous and briefly fimbriate; at maturity, splitting into several triangular segments through radiating stellate cracks. Asci not very numerous, about 10 in each thyriothecium, 8-spored, subglobose to ovate, sessile, with a thick, firm wall, $50\text{--}52.5 \times 45\text{--}47.5\ \mu$. Spores conglobate, oblong, broadly rounded at both ends, 1-septate, constricted, snuff brown, smooth, $25\text{--}29\ \mu$ long; cells subglobose to ovate, upper larger, $15\text{--}16\ \mu$ long and $14\text{--}15\ \mu$ broad, lower $11\text{--}14\ \mu$ long and $11\text{--}12.5\ \mu$ broad.

On *Vepris lanceolata* Don., Xumeni Forest, near Donnybrook, Doidge, 27742.

16. *Asterina Hendersoni* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 255, 275.

[Plate XX.]

Colonies amphigenous, black, irregularly circular in outline, mostly up to 3 mm. diam., occasionally up to 5 mm., scattered, sometimes numerous and becoming confluent.

Mycelium very variable in habit, at first loosely reticulate; with primary hyphae almost straight, forming angular meshes, or irregularly undulating and forming rounded meshes; frequently the spaces between the primary hyphae become completely filled with paler secondary hyphae and hyphopodia, thus forming a very close network, especially in the neighbourhood of the thyriothecia.

Hyphae dark olive buff to olive brown, $5\text{--}6\ \mu$ thick, very variable; sometimes almost straight to slightly undulating, not varying in width, sometimes more deeply and irregularly undulating, more or less tortuous and often subtorulose; both forms are often found on the same leaves. Hyphae closely septate, cells often $6\text{--}8\ \mu$ long, or up to $15\ \mu$ long; branches numerous, often opposite. Hyphopodia very numerous, unilateral or opposite, rarely opposite, hemispherical, very briefly cylindrical or obliquely flattened, mostly $5\text{--}7.5\ \mu$ long and $5\text{--}6\ \mu$ broad.

Thyriothecia numerous, scattered or somewhat crowded, more or less circular in outline, $150\text{--}200\ \mu$ diam. Basal layer delicate, subhyaline, structure not evident. Covering membrane slightly convex, at first dark olive buff, becoming blackish brown and opaque or subopaque, formed of rather loosely compacted, irregularly radiating hyphae about $3.5\ \mu$ thick; cells mostly $5\text{--}6\ \mu$ long; margin not fimbriate or rather sparsely so with fringing hyphae tortuous, $3\text{--}5\ \mu$ thick; at maturity developing irregularly radiating cracks, and central cells early falling away. Asci 8-spored, broadly ellipsoid to ovate, sessile or subsessile, $45\text{--}50 \times 26\text{--}33\ \mu$. Spores conglobate, oblong to narrow ovate, broadly rounded at both ends, 1-septate, deeply constricted, buffy brown, smooth, rather thin-walled; cells subglobose, upper definitely larger, $11\text{--}15\ \mu$ long and $12.5\text{--}15\ \mu$ broad, lower $10\text{--}12.5\ \mu$ long and $10\text{--}12\ \mu$ broad. Paraphysoids fairly well developed, indistinctly fibrose, breaking down early.

Pycnidia numerous, similar to the thyriothecia but smaller, $120\text{--}150\ \mu$ diam. Conidia very variable in form and size, ovate, pyriform, ellipsoid or oblong, $20\text{--}30 \times 10\text{--}15\ \mu$, buffy brown with a distinct hyaline, medial band.

On *Ilex mitis* (L.) Radlk. (= *Ilex capensis* Sond. & Harv.) on leaves, Hog's Back, Alice, J. & M. Henderson 11341, 11342. Type: Hog's Back, Ruttray, 32372; Brander's High Forest, Victoria East, van der Byl, 9461; van Staden's Pass, Pole Evans, 11443 and Doidge, 10884; Woodville Forest, George, Doidge, 10943 and Ballenden, 32471; Storm's River, Humansdorp Distr., Doidge, 17187; Assegai Bush, Doidge, 17242; Alexandria, Doidge, 22418; Deepwalls, Knysna, Doidge, 17210; Caradoc's Bush, Knysna, Bottomley, 32119; Bracken Hill, Knysna, van der Byl 2314; Knysna, van der Byl 2289, 2266 and Laughton, 32469; Keiskama Hoek, Stayner 75, 32377; Jonkershoek, Stellenbosch, van der Byl 2199; Zwartkop near Maritzburg, T. R. Sim, 10574; Buccleuch near Cramond, Doidge, 11563; Woodbush, Doidge, 1753, Putterill, 32470 and van der Byl 1516; Duivelskantoor, Kaapschehoop, Pole Evans, 32376; Ncaga Mt., Luneberg, Galpin 9869, 32374.

This fungus occurs very commonly on *Ilex mitis*, in several collections being associated on the same leaves with *Asterina Bottomleyae* and in No. 10943 with *A. nodosa*. Although

the thyriothecium dehisces by an extensive break-down of the central part of the covering membrane, it does not seem to form quantities of mucilage, nor is the covering membrane strongly convex at maturity; it is not a typical Englerulaster form, and must be regarded as a transition form between the typical Englerulaster and Asterina proper. In habit it closely resembles *Englerulaster continuus* Syd., which also occurs on *Ilex*, but the latter is a much stouter species, with deeply and fairly regularly undulating hyphae.

17. *Asterina ferruginosa* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) p. 254.

[Plate XXI.]

Colonies epiphyllous, scattered, more or less circular, up to 8 mm. diam., thin, black, frequently coalescing and forming larger, irregular, compound colonies.

Mycelium rather closely reticulate, especially in the neighbourhood of the thyriothecia. Hyphae old gold to isabella colour, slightly undulating, 3.5–5 μ thick; parallel hyphae sometimes fuse and form thicker, radiating strands; cells mostly 20–27 μ long; branches numerous, irregular, often opposite. Hyphopodia alternate or unilateral, fairly numerous, usually 1-celled, subglobose, obovate or briefly cylindrical, rarely hemispherical, 6–10 μ long, 7.5–9 μ broad; 2-celled hyphopodia occasional, especially in the neighbourhood of the thyriothecia, 12.5–19 μ long, with a cylindrical basal cell 6–9 μ long, and terminal cell 6–9 μ broad, similar in form to the 1-celled hyphopodia.

Thyriothecia numerous, scattered or crowded, rarely remaining discrete, usually fusing in groups of 2–4 or more and forming larger, irregular, compound ascomata; single thyriothecia circular or somewhat oval in outline or flattened by lateral contact, 160–200 μ diam. Basal layer delicate, subhyaline, without recognisable structure. Covering membrane convex, at first pellucid, ochraceous tawny to isabella colour, becoming darker and opaque in the centre; composed of radiating hyphae 3–3.5 μ thick, central cells almost cubical, 3–5 μ long, marginal cells slightly longer, 5–8 μ long; margin copiously fimbriate, fringing hyphae paler, 2.5–3.5 μ thick, tortuous, septate; splitting at maturity into a number of narrow, triangular segments by means of radiating, stellate fissures. Asci fairly numerous, ca. 15 in each thyriothecium, 8-spored, subglobose to ovate, broadly rounded above, sessile, 35–45 \times 30–37.5 μ , embedded in a mucilaginous mass which is honey yellow to yellow ochre in colour. Spores conglobate, oblong, rounded at both ends, 1-septate, constricted, isabella colour, smooth, 23–26 μ long; upper cell larger, subglobose to ellipsoid, 12–14 μ long and 11–12.5 μ broad, lower ellipsoid, 11–12.5 μ long and 10–11 μ broad.

On *Cussonia umbellifera* Sond., on leaves, Woodbush, Doidge, 1774, Type.

Cussonia spicata Thunb., Sea View, Durban, van der Byl 67, 11360; Woodbush, van der Byl 1521; Durban, van der Byl 49.

18. *Asterina Bosmanae* Doidge nov. spec.

[Plate XXII.]

Colonies always epiphyllous, scattered, thin, greyish black, more or less circular in outline, 2–5 mm. diam., occasionally numerous and becoming confluent; not on leaf spots, but causing a reddish-brown discoloration of the leaf tissues immediately under the colony.

Mycelium delicate, loosely reticulate, forming an open network with angular meshes. Hyphae buffy brown, usually almost straight, slightly undulating in places, mostly 3.5–4 μ thick; cells mostly 20–25 μ long; branches usually opposite. Hyphopodia fairly numerous, unilateral or alternate, continuous, briefly cylindrical or subglobose, broadly rounded above, 5–7.5 μ long, 4.5–5 μ , rarely up to 6 μ broad.

Thyriothecia numerous, scattered, usually single, but sometimes confluent in small groups of 2–3, more or less circular in outline, 150–180 μ diam. Basal layer hyaline, delicate, structure not evident. Covering membrane slightly convex, opaque, blackish brown in the centre, more or less pellucid, buffy brown to snuff brown near the margin, composed of radiating hyphae 2.5–4 μ thick, cells 4–5 μ long in the centre, 7–10 μ long nearer the margin; margin not fimbriate or very sparsely so; central cells breaking down at maturity to form an irregular pore from which a few radiating cracks develop. Asci not numerous, 3–10 in a single thyriothecium, 8-spored, ovate, broadly rounded above, sessile, with a firm, thick wall, thickened round the apex (ca. 5 μ). Spores conglobate, oblong, broadly rounded at both ends, 1-septate, rather deeply constricted, 21–24 μ long; cells subglobose, almost equal, or the upper slightly larger, upper cell 11–12.5 μ long and 11–11.5 μ broad, lower 10–11.5 μ long and ca. 10 μ broad; when immature, subhyaline to buffy brown, with a broad darker zone (mummy brown) at each pole and on either side of the septum, later becoming mummy brown and zoning not evident; thick-walled, wall ca. 1 μ thick. Paraphysoids fairly numerous.

On *Chrysophyllum magaliesmontanum* Sond., Rooiwal, Eastern Transvaal, *M. Bosman*, 32808.

19. *Asterina delicata* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 253, 274. [Plate XXIII.]

Colonies amphigenous, usually epiphyllous, thin, greyish black, up to 8 mm. diam., often numerous and covering the whole, or a greater part of the upper surface of the leaf.

Mycelium loosely reticulate, pale, delicate. Hyphae slender, vinaceous buff to avellaneous, slightly undulating, 3-3.5 μ thick, cells mostly 20-24 μ long, branching irregular. Hyphopodia unilateral or alternate, 1-celled, very rarely 2-celled, 6-10 μ long, 6-10 μ broad, often broader than long, asymmetrical, extremely irregular and varied in shape, straight, curved or hooked, usually obtusely angular or sublobed with 2-3 shallow, blunt irregular lobes.

Thyriothecia scattered or in small groups of 2-3, round or somewhat irregular in outline, 100-150 μ diam. Basal layer hyaline or subhyaline, poorly developed and without recognisable structure. Covering membrane convex, pellucid, avellaneous to wood brown, composed of irregularly radiating hyphae, 2.5-3.5 μ thick, with cells, 3-5 μ long, rather loosely compacted; margin not fimbriate or sparsely so; at maturity splitting, by means of radiating fissures, into a number of irregular triangular segments, the central part finally falling away and leaving the developing asci exposed. Asci numerous, ca. 20-30 in each thyriothecium, globose or ovate, sessile, 8-spored, with a firm rather thick wall, 33-40 \times 26-33 μ . Spores conglobate, wood brown, oblong, broadly rounded at both ends, 1-septate, constricted, smooth, 20-22 \times 10-12 μ ; cells subglobose, subequal or the upper slightly broader.

Pycnidia very numerous, similar to the thyriothecia but smaller, 45-100 μ diam. Conidia army brown when mature, without lighter medial band or conspicuous germ spores, ovate, ellipsoid or subglobose, 19-24 \times 13-17.5 μ , rather thick-walled, wall about 1.5 μ thick.

On *Grewia lasiocarpa* E. Mey., on leaves, Mayville, Durban, Medley Wood, 9062, Type; Kentani, Pegler 2436, 10993.

Grewia occidentalis L., Pirie Forest, Kingwilliamstown, Doidge, 12297.

The host of the type collection was wrongly identified and originally given (Doidge l.c. as *Trimeria alnifolia*; see also under *Asterina Grewiae*).

20. *Asterina Grewiae* Cke.

Grevillea X (1882) 130. Theissen, Ann. Myc. 10 (1912) p. 189; Theiss., Die Gattung *Asterina* (1913) p. 76; Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) p. 253.

Plate XXIV.

Colonies amphigenous, mostly epiphyllous, irregularly scattered, very thin, greyish black, not sharply defined, up to about 5 mm. diam.; on the upper side of the leaf often very numerous, confluent and covering a great part of the leaf surface; on the lower side often following the course of the larger veins.

Mycelium rather loosely reticulate. Hyphae deep to dark olive buff, almost straight or slightly undulating, 3.5-4.5 μ thick; cells mostly 15-20 μ long; branches frequently opposite and often constricted at the junction with the main hyphae. Hyphopodia numerous, 1-celled, alternate, opposite or unilateral, straight or more or less uncinat, finger- or flask-shaped, less frequently irregular and sublobed, 7.5-10 μ long and 3.5-5 μ broad.

Thyriothecia fairly numerous, scattered or in small groups, usually discrete, only occasionally becoming confluent, round, broadly oval or somewhat irregular in outline, 100-150 μ diam. Basal layer subhyaline to light greyish olive, consisting of loosely radiating hyphae, not membranous. Covering membrane slightly convex, buffy brown, pellucid, becoming subopaque, composed of irregularly radiating, rather loosely compacted hyphae about 3 μ thick, central cells almost cubical, 3-3.5 μ long, marginal cells up to 5 μ long; margin more or less fimbriate, fringing hyphae paler, 2.5-3 μ thick; early splitting into a number of narrow, triangular segments, by stellate fissures which run out almost to the margin, the central part readily breaks away, exposing the asci. Asci ca. 8-10 in each thyriothecium, 8-spored, subglobose, sessile, with a firm, rather thick wall, 32-37.5 \times 30-33 μ . Spores conglobate, buffy brown, oblong, broadly rounded at both ends, 1-septate, constricted, smooth, 20-25 \times 10-12.5 μ ; cells subglobose, subequal or the upper slightly broader (ca. 1 μ) than the lower.

Pycnidia numerous, scattered, similar to the thyriothecia, 50–100 μ diam. Conidia ovate or oblong, 15–20 \times 9–12.5 μ , rather thick-walled, wall ca. 1 μ thick, buffy brown, without hyaline band but with conspicuous germ pores; germ pores 4, equatorial, or 8 more or less regularly placed in two equatorial bands.

On *Trimeria grandifolia* (Hochst.) Warb. (= *Trimeria alnifolia* Planch.), on leaves, Inanda, *Medley Wood* 639, 12333 Type; Pirie Forest, Kingwilliamstown, *Doidge*, 12289; Goodoo Bush near Mont-aux-Sources, 14131; Tugela Valley near Mont-aux-Sources, *Doidge*, 14133; Keurkloof Forest, George, *Doidge*, 17128; Storm's River, Humansdorp Distr., *Doidge*, 17184; Woodbush, *Doidge*, 17779; Lundie's Hill near Bulwer, *Doidge*, 30478; Knysna, *Bottomley*, 32245 and *van der Byl* 418; Bloukrantz, *van der Byl* 1394.

There has been some confusion between this fungus and the nearly related species *Asterina delicata*; on examination, this proves to be due to the incorrect identification of the hosts in Medley Wood's collections. The type collection of *Asterina Grewiae* (*Wood* 639) is not on *Grewia* but on *Trimeria*; conversely, the host of *A. delicata* is not *Trimeria* but *Grewia*. This conclusion is borne out by an examination of more recent collections in which adequate material of the host plants is available.

20a. *Asterina Grewiae* Cke. var. *zonata* Doidge nov. var.

Hyphopodia more frequently uncinata or sublobed than in the type. Conidia ellipsoid to subclavate, 16–21.5 \times 7.5–9 μ , buffy brown, with a conspicuous, hyaline, medial band.

On *Trimeria trinervis* Harv., on leaves, Howieson's Poort, near Grahamstown, *Doidge*, 12382.

21. *Asterina crotoniensis* (Doidge) Ryan.

Stevens and Ryan, The Microthyriaceae (1939) p. 52.

Syn : *Asterina crotonicola* Doidge (not Pat.), Bothalia I (1922) p. 76. [Plate XXV.]

Colonies amphigenous, but predominantly epiphyllous, thickly or sparsely scattered, thin, black, circular or somewhat irregular in outline, 2–5 mm. diam., or forming larger, irregular colonies by confluence.

Mycelium rather closely reticulate. Hyphae undulating, 3–5 μ thick, pellucid; older hyphae brownish olive, young hyphae paler, shading to isabella colour or dark olive buff at the tips of the branches; cells 10–25 μ long; branches alternate or unilateral, anastomosing freely. Hyphopodia fairly numerous, alternate or unilateral, occasionally opposite, 1-celled, mostly at right angles to the hyphae, usually more or less pear-shaped, less frequently uncinata or sublobed and irregular in form, 5–7.5 μ long, 3.5–5 μ broad.

Thyriothecia fairly evenly and closely distributed, not infrequently in groups of 2–5, which become more or less confluent, circular or somewhat irregular in outline, 100–140 μ diam. Basal layer indistinct, subhyaline, without recognisable structure. Covering membrane convex, about 50 μ high in the centre, light brownish olive, becoming darker, subopaque, formed of straight or slightly undulating, radiating hyphae 2.5–3.5 μ thick, central cells almost cubical, marginal cells up to 10 μ long; not very firmly compacted and early splitting into a number of triangular segments by irregular stellate fissures, which reach almost to the margin; margin not fimbriate. Asci 8-spored, subglobose or ovate, sessile, 36–40 \times 23–33 μ . Spores conglobate, oblong, broadly rounded at both ends, 1-septate, slightly or rather deeply constricted, dark olive buff, becoming light brownish olive, pellucid, verrucose-elchinate, 16–20 \times 7.5–11 μ ; upper cell usually broader, lower often tapering slightly to the rounded base.

Pycnidia numerous, interspersed with the thyriothecia and similar to them but smaller, up to 100 μ diam. Conidia ovate, pyriform or ellipsoid, light brownish olive to brownish, continuous, without lighter medial band, 17–20 \times 10–13 μ ; germinating through a pore at the base.

On *Croton rivularis* Muell., on leaves, East London, *Doidge*, 12427, Type, and 22412; Langholm Estates, Bathurst, *Doidge*, 12355; Donkerbosch, Grahamstown District, *Britten* 5452, 22340; Alexandria, *Doidge*, 22359; Woodville Forest, George, *Doidge*, 11018.

22. *Asterina Trichiliae* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) p. 253.

[Plate XXVI.]

Colonies epiphyllous, scattered irregularly, usually more or less circular in outline, up to 6 mm. diam., thin, black.

Mycelium more or less reticulate, meshes of network angular. Hyphae dark olive buff to buffy brown, straight or nearly so, 4–6 μ thick; cells mostly 15–25 μ long; branches often opposite and frequently at right angles to the hyphae. Hyphopodia numerous, unilateral, alternate or opposite, 1-celled, often at right angles to the hyphae, more or less cylindrical, finger-shaped or flask-shaped, mostly straight, less frequently slightly curved, rarely sublobed, 6–10 μ long, 4–5 μ broad.

Thyriothecia scattered or in groups, circular or slightly oval in outline or somewhat irregular, 150–220 μ diam.; often closely crowded in groups of 2–4, becoming confluent, and forming larger, compound ascomata. Basal layer thin, subhyaline, without recognisable structure. Covering membrane slightly convex, pellucid, composed of straight, radiating hyphae 3–4 μ thick, central cells olive brown, subopaque, 5–6 μ long, marginal cells paler, 7–8 μ long; margin fimbriate, fringing hyphae deep to dark olive buff, almost straight, septate, 2.5–3.5 μ thick and up to 130 μ long; at maturity splitting into a large number of narrow, triangular segments by means of radiating fissures, the central part breaking away readily. Asci few, up to ca. 10 in each thyriothecium, 8-spored, globose or broadly ovate, sessile, 40–55 \times 43–50 μ . Spores conglobate, oblong, broadly rounded at both ends, 1-septate, constricted, dark olive buff to olive brown, densely and minutely verruculose, 24–29 μ long; cells subglobose or broadly ovoid, upper broader, 12.5–16 μ long and 13–15 μ broad, lower 10–12.5 μ long and 10–12.5 μ broad.

On *Trichilia emetica* Vahl. (= *Trichilia Dregeana* Mey.) on leaves, Winkle Spruit, Doidge, Type, 9006; Louis Trichardt, V. A. Putterill, 11833.

23. *Asterina Trichocladi* Doidge nov. spec. [Plate XXVII.]

Colonies epiphyllous, widely scattered, very thin, greyish black, more or less circular in outline and up to 5 mm. diam.; not sharply defined and, on the leaf, only the thyriothecia visible to the naked eye as black pin points.

Mycelium delicate, very loosely reticulate. Hyphae pellucid, deep to dark olive buff, undulating slightly, 2.5–3.5 μ thick, rather obscurely septate, cells mostly 15–20 μ long, branching irregular. Hyphopodia few, remote, solitary, alternate or unilateral, continuous, subglobose or pulvinate to cylindrical, often flattened, less frequently more or less pyriform, rarely sublobed, often broader than long, 5–7.5 μ long, 5–7 μ broad.

Thyriothecia numerous, scattered, usually discrete but occasionally confluent, formed at the tips of lateral branches, which are usually very short, often 1-celled; at first fan-shaped but very rapidly becoming circular, 250–380 μ diam. Basal layer subhyaline, delicate, structure not evident. Covering membrane slightly convex, at first olive buff, soon becoming isabella colour and finally subopaque in the centre, formed of sinuous radiating hyphae 2.5–3.5 μ thick, with cells 5–7.5 μ long; margin entire, crenate, not fimbriate; at first closed, central cells breaking down early and forming a pore. Asci rather numerous, 8-spored, oblong to subclavate, rounded above, narrowed below rather abruptly into a short, peg-like foot, 50–72.5 \times 17–18 μ . Spores distichous to conglobate, oblong, rounded at both ends, 1-septate, slightly constricted, deep to dark olive buff, smooth, thin-walled, 13–15 \times 6–7 μ ; cells subequal or the upper slightly broader. Paraphyses numerous, fibrose, breaking down as the asci approach maturity, into a yellowish-brown mucilaginous mass.

On *Trichocladus crinitus* Pers., on leaves, Knysna, Bottomley, 32231; Deepwalls, Knysna, Bottomley, 32211.

24. *Asterina raripoda* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 254, 276. [Plate XXVIII.]

Colonies epiphyllous, thin, greyish black, more or less circular in outline, 3–5 mm. diam., scattered or becoming confluent and forming larger, irregular colonies.

Mycelium deep to dark olive buff, radiating, becoming very loosely reticulate. Hyphae more or less sinuous, 3.5–5 μ thick, rather closely septate, cells mostly 10–15 μ long; branching distant, irregular. Hyphopodia few, alternate or unilateral, rather distant, 1-celled, hemispherical to subglobose, 5–7.5 μ diam., or 4–5 μ long and 6–7 μ broad; occasionally 2-celled, clavate, with subglobose terminal cell, 10–11 μ long and 5–6 μ broad.

Thyriothecia fairly numerous, scattered or becoming confluent in groups of 2–4; arising at the tips of very short, or longer hyphal branches and often fan-shaped at first, rapidly becoming more or less circular in outline, 150–220 μ diam. Basal layer hyaline, poorly developed, structure not evident; covering membrane slightly convex, buffy brown to snuff brown, pellucid, becoming subopaque in the centre, formed of irregularly radiating,

somewhat tortuous hyphae, mostly 2-3 μ thick, with cells 5-6 μ long in the centre, 6-10 μ long near the margin; margin irregular, not fimbriate or very sparsely so; central cells breaking down and forming an irregular pore from which radiating fissures finally develop. Asci fairly numerous, ca. 20-30 in each thyriothecium, usually 8-spored, sometimes 4-6-spored, ellipsoid to subclavate, rounded above, narrowing below gradually or abruptly into a short peg-like foot, 50-60 \times 17-20 μ , with a firm, thick wall. Spores distichous to conglabate, subclavate, rounded at the ends or lower end subacute, 1-septate, constricted, smooth, buffy brown with two more or less distinct, transverse, hyaline bands in each cell, 15-21.5 μ long; upper cell broader and more broadly rounded, ovoid to subglobose, 8-10 μ long and 7.5-10 μ broad, lower ellipsoid to cuneate, 7-10 μ long and 6-7 μ broad; occasionally 4-spored asci contain two normal 1-septate spores and two 1-celled spores, the latter being fusoid or ovoid, tapering to blunt ends or rounded above, 17.5-19 \times 10-11.5 μ , with two transverse, hyaline bands.

On *Ansellia africana* Lindl., on leaves, Zululand, *Franks*, 6687.

25. *Asterina Pavoniae* Werd.

Rep. Spec. Nov. Reg. Veg. XIX (1923) p. 50.

[Plate XXIX.]

Colonies amphigenous, mostly epiphyllous, only occasional, scattered colonies being found on the under side of the leaf, scattered, black, round to irregular, 1-2 mm. diam.; usually very numerous on the upper side of the leaf, becoming more or less confluent and covering a great part of the leaf surface.

Mycelium at first radiating, early becoming more or less reticulate, often forming a rather close network in the neighbourhood of the thyriothecia. Hyphae deep olive buff near the growing tips, becoming buffy brown, deeply undulating, 3-5 μ thick, mostly 4 μ , not infrequently running parallel with one another, becoming fused and forming strands of 2-3 hyphae; rather indistinctly septate, cells mostly 12-18 μ long; branching irregular. Hyphopodia fairly numerous, alternate or unilateral, 1-celled, 5-8 μ , rarely up to 10 μ long, 6-10 μ broad, often broader than long, typically 3-lobed, with rather shallow, rounded lobes, less frequently 2-4-lobed, symmetrical or irregular.

Thyriothecia numerous, closely crowded, especially near the centre of the colony, 75-100 μ diam., more or less circular, rarely discrete, becoming fused in groups of 2 to many, and thus forming larger, irregular, compound ascomata. Basal layer subhyaline, delicate, without recognisable structure. Covering membrane slightly convex, at first pellucid, dark olive buff to buffy brown, becoming darker, subopaque, composed of rather loosely compacted, slightly undulating, radiating hyphae, 3-4 μ thick; central cells 2-4 μ long, marginal cells somewhat longer; margin not fimbriate; splitting at maturity into a number of triangular segments by means of irregularly radiating cracks, the central part finally falling away and exposing the developing asci. Asci numerous, up to 25 in each thyriothecium, 8-spored, ovate or subglobose, broadly rounded above, sessile, 35-42 \times 25-40 μ . Spores conglabate, oblong, rounded at both ends, 1-septate, constricted, smooth, buffy brown, pellucid, 14-16 μ long; cells about equal in length, subglobose, upper 8-9 μ broad, lower 7-7.5 μ .

Pycnidia numerous, similar to the thyriothecia and interspersed with them, 50-90 μ diam. Conidia buffy brown to olive brown, without lighter medial band, ovate, oblong or subglobose, 14-24 \times 10-13 μ .

On *Sida Hislopii* Burt Davy & Gr., on leaves, Durban, *van der Byl* 396, Type; Umkomaas, *Bottomley*, 11894.

Werdermann (l.c.) assigns this species to the sub-genus *Clypeolaster*, but no definitely radiating basal membrane can be observed in the thyriothecia. The conidia are not as long as stated in the original description, where the measurements are given as 18-30 \times 10-13 μ . The type is not on *Pavonia* sp., but on *Sida Hislopii*.

26. *Asterina xumenensis* Doidge nov. spec.

[Plate XXX.]

Colonies amphigenous and cauliculous, not conspicuous, thin, greyish black, minute, up to 1 mm. diam., scattered irregularly, discrete or tending to become confluent. Mycelium loosely reticulate. Hyphae ecru olive to light brownish olive, more or less undulating, 2.5-3.5 μ thick, indistinctly septate, cells about 20 μ long; branching rather distant, irregular. Hyphopodia fairly numerous, solitary, unilateral or alternate, rarely opposite, 1-celled, very rarely 2-celled, very variable in form, erect, curved or appressed to the hyphae, usually more or less lobed, sometimes palmately lobed, but usually asymmetrical, often

broader than long, with 2-4 rounded, shallow or deeper lobes, rarely subcylindrical and more or less sinuous, 5-11 μ long and 5-10 μ broad, occasional 2-celled hyphopodia up to 12.5 μ long.

Thyriothecia scattered or crowded; arising at the tips of short hyphal branches, at first fan-shaped but rapidly becoming round to irregular in outline, 65-100 μ diam., often fusing laterally in groups of 2, 3 or more, and then forming compound ascomata which are elliptic or irregular in outline. Basal layer thin, subhyaline and without recognisable structure. Covering membrane slightly convex, at first pellucid, light brownish olive, becoming darker, subopaque, composed of radiating hyphae 2-2.5 μ thick, cells 3-5 μ long, not appreciably longer near the fimbriate margin; splitting at maturity, by stellate fissures, into a number of triangular segments. Asci rather numerous, ovate or ovate-globose, sessile, 8-spored, 18-20 \times 11-16 μ . Spores conglobate, deep olive buff, oblong, broadly rounded at both ends, slightly constricted, smooth, 11-12.5 \times 5-6 μ ; upper cell somewhat broader than the lower, which tapers slightly to the rounded end.

Pycnidia similar to the thyriothecia, but smaller, 37.5-50 μ diam. Conidia oblong, ellipsoid to subclavate, light brownish olive with a lighter medial band, 10-15 \times 4-6 μ .

On *Lobelia stellaroides* Bth. & Hk., Xumeni Forest, near Donnybrook, *Morgan and Doidge*, 30483, Type, and *Doidge* 32236.

27. *Asterina undulata* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 258, 278. [Plate XXXI.]

Colonies epiphyllous, black, more or less circular in outline, 0.5 to 3 mm. diam., scattered, discrete, or very numerous and becoming confluent, often covering the whole leaf surface.

Mycelium loosely reticulate, meshes curved, not angular. Hyphae ecru-olive, deeply undulating in more or less regular waves, 5-6.5 μ thick; cells mostly 15-22 μ long; branching distant, irregular. Hyphopodia fairly numerous, unilateral or alternate, 1-celled, broader than long, usually 5-6.5 μ long and 7-10 μ broad; more or less lobed and cut, sometimes palmately lobed, but often asymmetrical, with 2-5 rounded, shallow or deeper lobes; rarely almost entire, and then bolster-shaped or bluntly conical.

Thyriothecia developing at the tips of short hyphal branches, at first fan-shaped, rapidly becoming more or less circular in outline, 100-150 μ diam.; occasionally solitary, but usually developing in small groups and becoming fused in groups of 2-4 or more, thus forming larger irregular compound ascomata. Basal layer subhyaline, poorly developed, structure not evident. Covering membrane slightly convex, buff olive, pellucid, formed of radiating hyphae 2.5-3 μ thick, cells 4-8 μ long, not appreciably longer near the margin, which is not fimbriate; splitting at maturity into triangular segments, by irregularly radiating fissures. Asci rather numerous, ovate, 8-spored, broadly rounded above, sessile, 20-24 \times 17-20 μ . Spores conglobate, ovate-ellipsoid, olive buff or olive ecru, smooth, broadly rounded at both ends, 1-septate, constricted, 13-15 \times 6-8.5 μ ; upper loculus slightly broader.

On *Viola abyssinica* Steud., on leaves, Woodbush, Northern Transvaal, *Doidge* 1769 Type.

28. *Asterina Streptocarpi* Doidge.

Bothalia I (1924) p. 203. [Plate XXXII.]

Colonies epiphyllous, black, minute, round to irregular in outline but not sharply defined, up to 3 mm. diam.

Mycelium radiating, becoming loosely reticulate, or, in the larger colonies, more closely reticulate. Hyphae ecru olive to buffy olive or isabella colour to snuff brown, undulating, 3-4 μ thick, in places up to 5 μ thick, cells mostly 16-20 μ long, branching irregular. Hyphopodia fairly numerous, alternate or unilateral, lobed; erect, palmately lobed, more or less symmetrical, or more or less curved and bent, asymmetrical; deeply 3-5-lobed, mostly 3-lobed, lobes rounded or bilobulate; 6-10 μ long, usually broader than long, 8-13.5 μ broad.

Thyriothecia formed at the tips of short hyphal branches, at first fan-shaped, rapidly becoming circular or somewhat irregular in outline, scattered or in groups, 100-160 μ diam., often fusing laterally in small groups of 2-4 and forming larger, irregular, compound ascomata. Basal layer subhyaline, delicate, without recognisable structure. Covering membrane convex, pellucid, concolorous with the hyphae, composed of rather loosely compacted, radiating hyphae 2.5-3 μ thick, cells 5-6 μ long, not appreciably longer near

the margin, which is more or less fimbriate; splitting at maturity, by means of stellate fissures, into several triangular segments. Asci 4-spored, globose or broadly ovate, broadly rounded above, sessile, $20-24 \times 23-24 \mu$. Spores conglobate, oblong, rounded at both ends, 1-septate, slightly constricted, smooth, snuff brown, $15-18 \mu$ long; cells subequal, or the upper slightly broader, upper $7.5-9 \mu$ broad, lower $7-7.5 \mu$.

On *Streptocarpus Rexii* Lindl., on leaves, Deepwalls, Knysna, Doidge, 17223, Type; Deepwalls, Laughton, 30985 and van der Byl 2301.

Streptocarpus sp., Knysna, Laughton, 32078.

In all collections, the material is heavily parasitised by *Dimerium intermedium* and *Actinopeltella nitida*.

29. *Asterina gerbericola* Doidge.

Bothalia I (1924) p. 202.

[Plate XXXIII.]

Colonies epiphyllous, scattered or more or less confluent, round to irregular in outline, up to 5 mm. diam. Mycelium delicate, radiating, becoming loosely reticulate. Hyphae ecru olive to light brownish olive, sinuous, $3-3.5 \mu$ thick; cells $20-30 \mu$ long, mostly $24-27 \mu$; branching rather distant, irregular. Hyphopodia not very numerous, alternate or unilateral, 1-celled, erect or hooked, often appressed to the hyphae, often broader than long, $6-10 \mu$ long and $8-15 \mu$ broad; palmately or irregularly lobed, with 3-5 rounded, truncate or bilobulate lobes, often 5-lobed.

Thyriothecia formed at the tips of short hyphal branches, at first fan-shaped, soon becoming circular in outline or somewhat irregular, scattered or in groups, $100-130 \mu$ diam., often fusing in groups of 2-4 and forming larger, irregular, compound ascomata. Basal layer thin, delicate, subhyaline, structure not evident. Covering membrane slightly convex, composed of rather loosely compacted, radiating hyphae $2-2.5 \mu$ thick, cells mostly $5-6 \mu$ long, not noticeably longer at the margin: at first concolorous with the mycelium, later becoming darker and subopaque in the centre; splitting at maturity, by means of stellate radiating cracks, into several triangular segments. Asci 8-spored, ovate to subglobose, sessile, broadly rounded above, $23-30 \times 20-25 \mu$, with a rather thick, firm wall. Spores conglobate, oblong, broadly rounded at both ends, 1-septate, slightly constricted, brownish olive, subopaque, conspicuously verruculose, $13.5-17 \mu$ long; upper cell broader, $7.5-9 \mu$ broad, lower $6.5-7.5 \mu$ broad.

On *Gerbera cordata* Less., on leaves, Storm's River, Doidge, 17175, Type, Caradoc's Bush, Knysna, Bottomley, 32127; Deepwalls, Knysna, Bottomley, 32123.

Gerbera piloselloides Cass., Deepwalls, Knysna, J. Phillips (van der Byl 2223), 20381.

30. *Asterina woodiana* Doidge nov. comb.

Syn.: *Asterinella woodiana* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) p. 266.

Prillieuxina woodiana (Doidge) Ryan in Stevens and Ryan, The Microthyriaceae (1939) p. 78. [Plate XXXIV.]

Colonies hypophyllous, thin, greyish black, effuse, irregular in outline, not sharply defined.

Mycelium loosely or more closely reticulate. Hyphae slender, deep olive buff to avellanus and wood brown, more or less undulating, often tortuous, $2.5-4 \mu$ thick, branching freely and irregularly, septation obscure and irregular. Hyphopodia not numerous, alternate or unilateral, 1-celled or with a 1-5-celled stipe; 1-celled hyphopodia, or terminal cell of stipitate hyphopodia, clavate, cylindrical or irregular in shape, straight, bent or uncinate, $5-10 \mu$ long, $3-6 \mu$ broad; stipe 1-5-celled, slender, sinuous, very variable in length, $2.5-3 \mu$ thick.

Thyriothecia fairly numerous, scattered, usually discrete, occasionally confluent in small groups of 2-3, rarely more, more or less circular in outline, $140-160 \mu$ diam. Basal layer hyaline, indistinct, structure not evident. Covering membrane slightly convex, pellucid, buffy brown to snuff brown, becoming darker and subopaque in the centre, composed of radiating hyphae $2-3 \mu$ thick, central cells almost cubical, marginal cells slightly longer, $3-5 \mu$ long; margin entire, crenate or lobed, not fimbriate; at maturity breaking into a few broad triangular segments through the formation of radiating, stellate cracks. Asci broadly ovate, sessile, 8-spored, $33-37 \times 27-30 \mu$. Spores conglobate, oblong, broadly rounded at both ends, almost equally 1-septate, slightly constricted, snuff brown, smooth, $20-25 \times 10-11 \mu$; cells equal or the upper slightly larger.

Pycnidia numerous, similar to the thyriothecia but smaller, $60-100 \mu$ diam. Conidia avellanus, without hyaline band, broadly ellipsoid, ovate or broadly fusoid, $14-16 \times 8-10 \mu$.

On *Cryptocarya Woodii* Engl., on leaves, Mayville, Durban, *Medley Wood*, 9025, Type ; Berea, Durban, *van der Byl*, 11362.

The hyphopodia, which are not numerous and are rather inconspicuous, were overlooked when this fungus was described as an *Asterinella*.

31. *Asterina uncinata* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 252, 278. [Plate XXXV.]

Colonies hypophyllous, not on leaf spots, black, conspicuous, round, up to 6 mm. diam., or, when numerous, becoming confluent and covering larger areas of the leaf surface, especially near the leaf margins : sometimes covering the whole lower surface of the leaf.

Mycelium reticulate : primary hyphae buckthorn brown to cinnamon brown, radiating, somewhat undulating, rather stout, 5–6 μ thick, cells 15–35 μ long, often fusing longitudinally with parallel hyphae to form radiating strands ; numerous branches and secondary hyphae paler, rather more slender, usually 4–5 μ thick and more definitely undulating ; the latter form, with the hyphopodia, a more or less dense network between the primary hyphae. Hyphopodia alternate, unilateral or opposite, stipitate, 20–40 μ long, or rarely continuous, 13–15 μ long, uncinata, in the denser parts of the mycelial network becoming contorted and fusing with each other, or with adjacent hyphae ; stipe 1–3-celled, 7–30 μ long, cylindrical, equal in thickness to the hyphae, straight, curved, abruptly geniculate or gibbous and contorted, occasionally bearing two terminal cells ; terminal cell club-shaped or cylindrical, straight, uncinata or sinuous, occasionally sublobed, 10–15 μ long and 5–6.5 μ broad.

Thyriothecia numerous, scattered, large, buckthorn brown, round or somewhat irregular in outline, 200–250 μ diam., rarely up to 280 μ diam., usually single, rarely, fusing in groups of 2 or more to form larger composite thyriothecia ; covered with a network of darker, mycelial hyphae. Basal layer hyaline or subhyaline, without recognisable structure. Covering membrane convex, 60–80 μ high in the centre, buckthorn brown to cinnamon brown, composed of radiating hyphae 3–5 μ thick, with cells 3.5–7 μ long ; these are prolonged at the margin into a short, dense fringe of paler, tortuous hyphae ; at maturity splitting, by means of stellate fissures, into a number of more or less triangular segments, then breaking up irregularly. Asci numerous, 20–30 in each thyriothecium, 8-spored, subglobose to ovate, sessile, 45–55 \times 40–50 μ , with a firm, stout wall, ca. 1 μ thick, thickened round the apex when immature. Spores conglobate, oblong, rounded at both ends, 1-septate, deeply constricted, smooth, cinnamon brown, subopaque and almost black when mature, 29–34 \times 16–20 μ ; cells subglobose to ovoid, the upper larger, 16–20 μ long and 16–19 μ broad, the lower 12.5–15 μ long and 14–15 μ broad ; the cells separate rather readily at the septum ; immature, hyaline spores are apparently surrounded by a colourless, mucilaginous envelope.

On *Scolopia Mundtii* Presl., on leaves, Brander's High Forest, Victoria East, *van der Byl*, 9463b, Type ; Goodoo Bush, near Mont-aux-Sources, *Doidge*, 14134 ; Hogsback, Cape, *K. M. Putterill*, 30073.

This fungus was originally described (*Doidge*, loc. cit.) "on leaves of *Rhamnus prinoides*, 9463". Every leaf remaining of this collection has been examined, but this conspicuous fungus is not evident on this, nor on other collections of *Rhamnus prinoides* ; all that remains in connection with the collection numbered 9463, is the slide from which the species was described. The two collections on *Scolopia Mundtii* cited above agree with the fungus on this slide in every detail ; the species is very distinctive. It can only be concluded that some leaves of *Scolopia Mundtii* were originally mixed with those of *Rhamnus* in collection 9463 ; the fungus has been redescribed from No. 14134.

32. *Asterina reticulata* Kalch. & Cke. emend. *Doidge*.

Kalchbrenner and Cooke, *Grevillea* IX (1880) p. 33 ; *Doidge*, Trans. Roy. Soc. S. Afr. 8 (1920) p. 252.

Syn : *Meliola Oliniae* Kalch. in Herb. MacOwanianum.

Asterostomella reticulata (Kalch. & Cke.) v. Höhn., *Fragm. z. Myk.* 493 ; Theissen, *Die Gattung Asterina* (1913) p. 34. [Plate XXXVI.]

Colonies amphigenous, but more numerous on the upper side of the leaf, thin, black, round to irregular in outline, often numerous, especially on the veins and leaf margins, frequently coalescent and covering the greater part of the leaf surface.

Mycelium rather closely reticulate, occasionally, in the centre of the colony, very closely compact, and with hardly any spaces between the hyphae. Hyphae tawny olive, straight or more or less undulating, $4.5-6\ \mu$ thick; branching freely, branches often opposite; cells mostly $15-25\ \mu$ long. Hyphopodia fairly numerous, alternate or unilateral, 2-celled, straight, curved or hooked, $7-15\ \mu$ long; basal cell cylindrical, equal in thickness to the hyphae, $3.75-5\ \mu$ long; terminal cell ovate, cylindrical or irregular and sublobed, $6-10\ \mu$ broad.

Thyriothecia comparatively rare, round or somewhat irregular in outline, $160-200\ \mu$ diam. Basal layer pale smoke grey, structure not evident. Covering membrane slightly convex, cinnamon brown, becoming more decidedly convex and subopaque, composed of radiating hyphae, $3-3.5\ \mu$ thick, central cells almost cubical, $3-4\ \mu$ long, marginal cells up to $7.5\ \mu$ long; margin fimbriate; at maturity splitting, by numerous radiating fissures into a number of narrow, triangular segments, the centre of the covering membrane finally falling away and exposing the asci, which are embedded in ochraceous mucilaginous matter. Asci 8-spored, ovate, sessile, $45-50 \times 30-33\ \mu$. Spores conglobate, oblong, rounded at both ends, 1-septate, rather deeply constricted, smooth, snuff brown, $20-23 \times 9-11\ \mu$; cells subglobose, subequal, or the upper slightly broader.

Pycnidia very numerous, similar to the thyriothecia but smaller, $100-150\ \mu$ diam. Conidia ellipsoid, ovate or pyriform, snuff brown with a hyaline medial band, $16-20 \times 7-12.5\ \mu$.

On *Olinia cymosa* Thunb., Boschberg Mts., near Somerset East, *MacOwan* 1336, Type, (Rabh. Wint. Fung. Eur. 3337) 3677, 20800, 21944; Goodoo Bush near Mont-aux-Sources, *Doidge*, 14136; Deepwalls, Knysna. *Doidge*, 17199; Knysna, *van der Byl* 2282, 2284; Addo Bush, *J. Phillips*, 21012.

Olinia emarginata Burt Davy, Mont-aux-Sources, Natal, *Doidge* 23402; Schurink's Kloof, Lydenburg, *Obermeyer* and *Verdoorn*, 34, 30477.

Olinia radiata Hofmeyr & Phillips, Ingeli Forest, Natal, *Chilvers*, 30462.

Olinia sp., Barberton, *Galpin* 1275, 15497.

The thyriothecia of this fungus were described (*Doidge*, loc. cit.) from No. 15497; more recently some thyriothecia, mostly immature, have been found on a portion of the type collection, labelled "Herbarium MacOwanianum No. 1336 Crypt. Austro-africana, *Meliola Oliniae* Kalch. Type"; this specimen is No. 20800 in the Cryptogamic Herbarium at Pretoria. There are also some thyriothecia on No. 17199, but they are comparatively few.

33. *Asterina Scolopiae* Doidge.

Bothalia I (1922) p. 77.

[Plate XXXVII.]

Colonies amphigenous, mostly hypophyllous, thin, greyish black, round to irregular in outline, up to 5 mm. diam.; when numerous coalescing to form larger irregular blotches, especially along the veins and leaf margins.

Mycelium delicate, loosely reticulate. Hyphae deep to dark olive buff, straight or slightly undulating, $3-3.75\ \mu$ thick; cells mostly $20-25\ \mu$ long; branching irregular. Hyphopodia fairly numerous, alternate or unilateral, 2-celled, mostly cylindrical, straight, frequently at right angles to the hyphae; less frequently clavate, slightly curved or subuncinate; $10-19\ \mu$ long and $3-4\ \mu$, rarely up to $5\ \mu$, broad, basal cell cylindrical, $3.5-6\ \mu$ long.

Thyriothecia fairly numerous, scattered, not infrequently connate in pairs, rarely in groups of 3-5 units, circular in outline, or becoming somewhat angular when in contact, $130-170\ \mu$ diam. Basal layer poorly developed, structure not evident. Covering membrane slightly convex, olive brown, subopaque, composed of radiating hyphae $2.5-3\ \mu$ thick, cells almost cubical, $3-4\ \mu$ long near the centre, up to $5\ \mu$ long near the margin; margin more or less fimbriate, fringing hyphae greyish olive to light greyish olive, $2.5-3\ \mu$ thick, tortuous and up to ca. $75\ \mu$ long. Asci up to 10 in each thyriothecium, 8-spored, subglobose to ovate, sessile, $32-40 \times 30-35\ \mu$, with a firm, thick wall. Spores conglobate, oblong, rounded at both ends, 1-septate, slightly constricted, buffy brown, smooth, $20-25 \times 9-11\ \mu$; cells subequal or the upper slightly broader.

Pycnidia similar to the thyriothecia but smaller, $70-120\ \mu$ diam. Conidia olive brown, without lighter medial band, usually rhomboid, with 4 conspicuous, hyaline, papillate germ pores at the angles, less frequently ovate to clavate, rarely ellipsoid, with 4 subequatorial germ pores, $17-25 \times 10-13.5\ \mu$.

On *Scolopia Zeyheri* (Szysz.) Nees, on leaves, East London, *Doidge* 12414, Type; Hog's Back, K. M. Putterill, 30084; Alexandria, *Doidge*, 22422; Kentani, *Pegler*, 8393a.
Scolopia Zeyheri (Szysz.) Nees var. *spinosa*, Mossel Bay, *Pole-Evans*, 9067b.
Scolopia Mundtii Presl., Long Ridge, Knysna, *Doidge*, 17227.

34. *Asterina Saniculae* Doidge nov. spec. [Plate XXXVIII.]

Colonies amphigenous, black, more or less circular in outline, 1-2.5 mm. diam.; sometimes numerous and confluent, and then forming larger irregular blotches.

Mycelium reticulate, meshes of network curved, not sharply angular. Hyphae tawny olive, paler at the growing tips, deeply undulating, 3-5 μ thick, cells mostly 20-25 μ long, branching usually alternate. Hyphopodia 2-celled, very rarely 1- or 3-celled, alternate or unilateral, at right angles to the hypha or inclined towards it, straight, curved or uncinat, 10-15 μ long; basal cell straight or curved, 2.5-7.5 μ long, cylindrical, 3.5-4 μ thick, rarely gibbous; terminal cell very irregular, erect, symmetrical, or curved or hooked and asymmetrical, usually more or less lobed, with 2-5 rounded or truncate lobes, 7.5-11 μ broad.

Thyriothecia very numerous, crowded, 100-130 μ diam., round to irregular in outline, often fusing laterally and forming large, irregular, compound ascomata, but not infrequently fused in an irregular circle near the centre of the colony. Basal layer delicate, subhyaline, structure not evident; occasionally pale greyish fuscous, with a delicate radiating structure which readily falls apart under pressure. Covering membrane at first concolorous with the mycelium, becoming dark brown and subopaque, convex, composed of radiating hyphae 2.5-3.5 μ thick, with cells 3.5-5 μ long in the centre, somewhat longer, up to 8 μ long near the margin; margin not fimbriate, or very briefly and sparsely so; splitting at maturity into triangular segments by means of stellate fissures. Asci 8-spored, fairly numerous, up to ca. 20 in each thyriothecium, ovate or subglobose, sessile, 20-25 \times 17.5-20 μ , with a firm, rather thick wall. Spores conglobate, tawny olive, oblong, rounded at both ends, smooth, 1-septate, slightly constricted, 12.5-15 \times 5-6.25 μ ; upper cell slightly broader than the lower.

On *Sanicula europaea* L., Woodbush, *Doidge* 28331, Type.

It is possible that this species should be placed in the section *Clypeolaster*, but the basal layer is composed of loosely radiating hyphae, and is not typically membranous.

35. *Asterina fimbriata* Kalch. et Cke.

Grevillea IX (1880) p. 33. *Doidge*, Trans. Roy. Soc. S. Afr. 8 (1920) p. 251.

Syn.: *Meliola Sclerochitonis* Kalch., Crypt. Austro-afric. Herb. MacOwan 1290.

Asterina punctiformis Lév. var. *fimbriata* Theissen, Die Gattung *Asterina* (1913) p. 67. [Plate XXXIX.]

Colonies epiphyllous, scattered, thin, inconspicuous, 1-2.5 mm. diam., more or less circular, becoming confluent when numerous, and covering larger areas of the leaf surface.

Mycelium loosely reticulate. Hyphae buffy brown, undulating or almost straight, 4-6 μ thick, cells mostly 16-22.5 μ long, branching rather remote, irregular. Hyphopodia numerous, alternate or unilateral, rarely opposite, 2-celled, usually hooked or boot-shaped, rarely symmetrical, 8-12 μ long; basal cell usually cylindrical, 3-5 μ long and 4-5 μ broad, rarely gibbous; terminal cell 6-10 μ broad, irregular in form and usually with 2-3 broad, shallow lobes.

Thyriothecia numerous, often crowded and becoming fused laterally in groups of two or more, irregularly circular in outline, 130-170 μ diam., or oval, 170-180 \times 130-150 μ . Basal layer hyaline or subhyaline, without recognisable structure. Covering membrane slightly convex, buffy brown to olive brown, becoming subopaque, formed of radiating hyphae, 3.5-4 μ thick, central cells almost cubical, cells near the margin 5-6 μ long; margin fimbriate, fringing hyphae paler, somewhat tortuous, remotely septate, ca. 3 μ thick and up to 100 μ long; dehiscing by means of a number of radiating fissures, the central part finally breaking away and exposing the asci. Asci fairly numerous, 8-spored, globose, 28-34 μ diam., or ovate, 36-48 \times 26-28 μ . Spores conglobate, olive brown, oblong, rounded at both ends, 1-septate, slightly constricted, punctate, 17.5-22 \times 8-10 μ ; cells subequal or the upper slightly broader.

On *Sclerochiton harveyanus* Nees, on leaves, "in silvis ad lat. Mtis Boschberg, C.B.S., Nov. LXXXVI, Herb. MacOwan No. 1290, Crypt. Austr. Afr.", Type (Herb. Kew and Herb. S. Afr. Museum, Capetown, No. 33496); East London, *Doidge*, 10910, 10900; Pirie Forest, Kingwilliamstown, *Doidge*, 12329.

Hypoestes aristata R. Br., Inanda, *Medley Wood 608*, 10189, and Herb. Kew.
Thunbergia sp., East London, *Doidge*, 12268; Buccleuch, near Cramond, Natal,
Doidge, 11584

In a previous paper (*Doidge* l.c.) the host of No. 10900 was erroneously given as *Plectronia ciliata*.

36. *Asterina Combreti* Syd.

Engl. Bot. Jahrb. 44 (1910) p. 264; Theissen, Die Gattung *Asterina* (1913) p. 249;
Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) p. 249.

Syn.: *Hyphaster kutuensis* P. Henn., Bot. Ergebnisse der Kunene-Sambesi Exped. (1903) p. 169.

Asterina (*Dimerosporium*) *kutuensis* (P. Hönn.) v. Hohn., Fragm. z. Myk. 12, No. 599.

Asterina Combreti var. *kutuensis* (P. Hönn.) v. Hohn., Theiss. Die Gattung *Asterina* (1913) p. 63. [Plate XL.]

Colonies amphigenous, mostly epiphyllous, not on leaf spots, scattered, thin, black, round to irregular in outline, often very numerous on the upper side of the leaf and covering the greater part of its surface.

Mycelium reticulate, forming a fairly close and regular network, of which the meshes are often almost rectangular. Hyphae buffy brown, sometimes paler, deep colonial buff, straight or slightly undulating 3-4.5 μ thick, less frequently up to 5 μ thick; cells usually 15-20 μ long; branches numerous, often opposite. Hyphopodia fairly numerous, alternate or unilateral, 2-celled, straight or more or less curved, 8-17.5 μ long; basal cell cylindrical, 2-5 μ long, 4-5 μ broad; terminal cell very variable, 4-10 μ broad, cylindrical, clavate, hooked or slightly lobed, with 2-4 blunt, shallow lobes.

Thyriothecia fairly numerous, scattered or in irregular groups, circular in outline or becoming irregular and somewhat angular by mutual contact, 140-180 μ diam. Basal layer indistinct, hyaline or subhyaline without recognisable structure. Covering membrane slightly convex, buffy brown to olive brown, pellucid, ca. 40 μ high in the centre, composed of radiating hyphae 2.5-3.5 μ thick, cells 4-5 μ long near the centre, up to 7 μ long near the margin; margin copiously fimbriate, fringing hyphae paler, rather tortuous, remotely septate, 2.5-3 μ thick and up to 70 μ long; dehiscing at maturity by stellate fissures running out almost to the margin and dividing the membrane into triangular segments. Asci fairly numerous, 8-spored, globose or broadly ovate, sessile, 28-40 \times 28-32 μ , with a firm, thick wall. Spores conglobate, oblong, rounded at both ends, 1-septate, constricted, olive brown, minutely verrucose at maturity, 18-24 \times 8-11 μ ; cells subequal, or the upper somewhat broader.

Pycnidia similar to the thyriothecia but smaller, 60-90 μ diam. Conidia ellipsoid, ovate, subclavate or irregular in shape, buffy brown with a lighter medial band, 18-26 \times 9-13 μ .

On *Combretum Baumii* Engl. & Gilg., on leaves, Kutue, Angola, *Baum 751*.

Combretum Kraussii Hochst., Louis Trichardt, V. A. Putterill, 11829; Woodbush, *Doidge*, 1773; Buccleuch, near Cramond. *Sim*, 10152; Springfield, Natal, *Medley Wood*, 9021.

Combretum glomeruliflorum Sand., Woodbush, *Doidge*, 17719, 28343; Entabeni, Northern Transvaal, *Wager*, 26371.

Asterina Combreti Syd. was originally described from material collected at Kibwezi, British East Africa, on leaves of *Combretum tavatense* (Herb. Sydow and Berlin). It appears to be of common occurrence on *Combretum* spp. in South Africa, and as pointed out previously (*Doidge* loc. cit.) is a variable species, the thickness of the hyphae, size of hyphopodia, spores and conidia varying, even on the same leaf, within the limits indicated.

The description of v. Höhnel's species *Asterina kutuensis* conforms with that of the South African collections of *Asterina Combreti* except in one particular: the conidia are said to be 22-32 \times 14 μ , i.e. slightly larger than those found in the other collections. In view of the variability of the species, it would appear that the Kutue collection should be regarded as *A. Combreti*.

37. *Asterina Peglerae* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 250, 276. [Plate XLI.]

Colonies amphigenous, more frequently hypophyllous, not on leaf spots, scattered thin, spreading, greyish black, irregular in outline, up to 5 mm. diam., often more numerous near the margin and the base of the leaf.

Mycelium very loosely reticulate. **Hyphae** slender, honey yellow to isabella colour, more or less undulating, $3.5\text{--}4\text{ }\mu$ or up to $5\text{ }\mu$ thick; cells mostly $20\text{--}30\text{ }\mu$ long; branching distant and rather irregular. **Hyphopodia** alternate or unilateral, very rarely opposite, 2-celled, curved or hooked, rarely straight, usually inclined towards the hypha, rarely at right angles to it, $10\text{--}18\text{ }\mu$ long, $5\text{--}6.5\text{ }\mu$, rarely up to $10\text{ }\mu$ broad; basal cell usually cylindrical, sometimes gibbous, $3\text{--}10\text{ }\mu$ long; apical cell very irregular in form, usually asymmetrical, more or less lobed, with 2-3 blunt lobes, often boot-shaped, less frequently uncinuate, rarely almost entire and club-shaped.

Thyriothecia scattered, not infrequently in rather close groups of 2-3, round or somewhat irregular in outline, $150\text{--}180\text{ }\mu$ diam. Basal layer poorly developed, structure not evident. Covering membrane pellucid, honey yellow to yellow ochre; at first slightly convex, composed of irregularly radiating hyphae $3\text{--}4\text{ }\mu$ thick, with cells $3.5\text{--}5\text{ }\mu$ long in the centre, up to $7.5\text{ }\mu$ long near the margin, which is more or less fimbriate; at maturity becoming more decidedly convex, owing to the formation of mucilaginous matter round the asci; splitting by means of irregular stellate fissures, the central cells falling apart. Asci globose or subglobose, fairly numerous, 8-spored, sessile, thick-walled, $42\text{--}52.5\text{ }\mu$ diam.; at first with numerous colourless paraphysoids, which break down and form a mucilaginous mass, honey yellow or occasionally orange, in which the asci are embedded at maturity. Spores conglobate, oblong, rounded at both ends, 1-septate, constricted, at first isabella colour, then darker, subopaque at maturity, $25\text{--}30 \times 12.5\text{--}16.5\text{ }\mu$, coarsely and conspicuously echinulate, adorned with spinules up to $2.5\text{ }\mu$ long; cells subglobose, the upper larger, $13.75\text{--}17.5\text{ }\mu$ long and $13.75\text{--}16.5\text{ }\mu$ broad. Lower cell $11.25\text{--}12.5\text{ }\mu$ diam.

On *Maerua* sp., on leaves, Kentani, Pegler 2354, 9130, Type.

Maerua pedunculosa Hochst., Stella Bush, Durban, Schiltz, 14705; The Wilderness, Cape, Doidge, 17124a.

The host of the type collection, No. 9130, was originally identified as probably a *Rhus* sp.; further collections indicate that it is *Maerua* sp.; *Meliola Bosciae*, which occurs only on Capparidaceae, is present on the leaves of 9130, and in the material from the Wilderness, *Asterina Peglerae* is associated on the same leaves with *Meliola Bosciae* and *Cyclothecha Bosciae*; *Maerua pedunculosa* was formerly known as *Boscia caffra*, the latter name being now regarded as a synonym.

38. *Asterina loranthicola* Syd.

Ann. Myc. 12 (1914) p. 266; Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) p. 263.

[Plate XLII.]

Colonies amphigenous, thin, black, conspicuous, round to irregular in outline, up to 6 mm. diam.; often very numerous, especially on the upper side of the leaf, coalescing to form large, irregular blotches and covering a large part of the leaf surface.

Mycelium reticulate, meshes of network angular. **Hyphae** buffy brown, straight or somewhat undulating, $4\text{--}5\text{ }\mu$, rarely up to $6\text{ }\mu$ thick, cells mostly $15\text{--}20\text{ }\mu$ long, branching irregular. **Hyphopodia** fairly numerous, alternate or unilateral, mostly 1-celled, usually at right angles to the hyphae or nearly so, $7.5\text{--}11\text{ }\mu$ long, $5\text{--}6\text{ }\mu$ broad, cylindrical to ovate, straight to subuncinate; 2-celled hyphopodia rare, up to $14\text{ }\mu$ long, with a short, cylindrical basal cell.

Thyriothecia closely crowded, round to irregular in outline, frequently becoming fused laterally and forming larger, irregular, compound ascomata; single thyriothecia $100\text{--}160\text{ }\mu$ diam.; basal membrane firm, smoke grey to greyish olive, composed of radiating hyphae $2.5\text{--}4\text{ }\mu$ thick. Covering membrane convex, at first buffy brown, becoming darker, subopaque, composed of radiating hyphae $2.5\text{--}4\text{ }\mu$ thick, central cells almost cubical, marginal cells longer, up to $7.5\text{ }\mu$ long; margin more or less fimbriate; at maturity splitting, by means of irregular stellate fissures, the central cells falling away and exposing the developing asci. Asci ca. 12-15 in each thyriothecium, ovate to globose, sessile, $30\text{--}38 \times 24\text{--}30\text{ }\mu$. Spores oblong, rounded at both ends, 1-septate, constricted, buffy brown, closely and conspicuously echinulate, $20\text{--}26 \times 8\text{--}14\text{ }\mu$; cells subglobose, the upper slightly broader.

Pycnidia numerous, similar to the thyriothecia but smaller, $75\text{--}100\text{ }\mu$ diam. **Conidia** ovate to pyriform, buffy brown, with an indistinct, paler medial band, $15\text{--}22 \times 9\text{--}11\text{ }\mu$.

On *Loranthus* sp., on leaves, Quelimane, Mozambique, Pole Evans 7385, Type.

Loranthus Dregei Eckl. & Zeyh., Kentani, Pegler 2302, 8863; Bluff, Durban, Morgan and Doidge, 32156.

39. *Asterina polythyria* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 258, 276. [Plate XLIII.]

Colonies amphigenous and caulicolous, mostly epiphyllous, dense black, more or less circular in outline, 1-4 mm. diam., often numerous and becoming confluent.

Mycelium reticulate, becoming very closely interwoven and dense in the centre of the colony, where it is finally almost concealed by the dense groups of thyriothecia and pycnidia. Hyphae deep or dark olive buff to tawny olive, somewhat sinuous, $3.5-4\ \mu$ thick, cells mostly $15-20\ \mu$ long, branches very numerous, opposite or irregular. Hyphopodia not very numerous, alternate or unilateral, mostly 1-celled, often broader than long, $5-9\ \mu$ long, $6-10\ \mu$ broad, erect or hooked, mostly 2-3-lobed; many are 3-lobed, symmetrical, and like a trefoil in shape, others are irregular; lobes rounded or retuse; rarely 2-celled, $10-12.5\ \mu$ long and $6-7.5\ \mu$ broad, with gibbous basal cell.

Thyriothecia very numerous and closely crowded, more or less circular in outline, $150-200\ \mu$ diam., rarely solitary, usually fused laterally in groups of 2-4 or many, forming irregular or elongated composite ascumata; in extreme cases, the centre of the colony is an almost continuous mass of thyriothecia and pycnidia, surrounded by a fringe of hyphae. Basal membrane deep olive buff, more or less firmly compacted, radiating in structure, composed of hyphae $2.5-3.5\ \mu$ thick. Covering membrane convex, snuff brown, becoming darker, subopaque, firm, composed of radiating hyphae $2.5-3.5\ \mu$ thick, central cells almost cubical, $3-5\ \mu$ long, margin not fimbriate; splitting at maturity, by stellate fissures, into several triangular segments. Asci fairly numerous, 8-spored, ovate, broadly rounded above, sessile, $27.5-35 \times 20-25\ \mu$, with a firm, rather thick wall, somewhat thickened, $2.5-3\ \mu$ round the apex; at maturity becoming more elongated, clavate and without apical thickening $37.5-45 \times 15-17.5\ \mu$. Spores conglobate, buffy brown, oblong, rounded at both ends, 1-septate, slightly constricted, smooth, $14-17.5\ \mu$ long; upper cell broader and more broadly rounded, $7.5-9\ \mu$ long and $6-7.5\ \mu$ broad, lower $6-7.5\ \mu$ long and $5.5-7\ \mu$ broad.

Pycnidia very numerous, in groups or interspersed with the thyriothecia, similar to the latter but smaller, $65-120\ \mu$ diam. Conidia ovate to pyriform, more rarely oblong, buffy brown with a distinct, subhyaline, medial band, $14-19 \times 7.5-11\ \mu$.

On *Osyridicarpus natalensis* A. DC., Tongaat, van der Byl, 6949, Type; Langholm Estates, Bathurst, Doidge, 12345; Pirie Forest, Kingwilliamstown, Doidge, 12326a, 22420.

40. *Asterina clausenicola* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 263, 273. [Plate XLIV.]

Colonies amphigenous, mostly epiphyllous, thin, greyish black, not sharply defined, irregular in outline; at first small, later spreading, becoming confluent and covering the greater part of the upper surface of the leaf.

Mycelium delicate, loosely reticulate, hyphae deep to dark olive buff, $2.5-3.5\ \mu$ thick, more or less undulating, rarely straight, cells very variable in length, $15-30\ \mu$ long; branches fairly numerous, irregular, sometimes opposite. Hyphopodia alternate or unilateral, rarely opposite, elegant and varied in form; usually 1-celled, $7-11\ \mu$ long and $10-14\ \mu$ broad, spreading from a narrow base, 3-4-, rarely 5-6 lobed, lobes rounded, truncate, retuse or bilobulate, erect, more or less symmetrical and palmately lobed, or more or less curved and asymmetrical; occasionally 2-celled, $10-17.5\ \mu$ long, with basal cell cylindrical and up to $10\ \mu$ long, or with the cross wall more or less oblique between two lobes.

Thyriothecia scattered or in small groups, more or less circular in outline, $120-160\ \mu$ diam., sometimes confluent or fused in groups of 2-4. Basal membrane smoke grey to greyish olive, firm, composed of radiating hyphae $2-3\ \mu$ thick. Covering membrane convex, buffy brown to olive brown, composed of radiating hyphae $2-3\ \mu$ thick, cells almost cubical, $2.5-3.5\ \mu$ long, or up to $5\ \mu$ long; margin usually copiously fimbriate; splitting at maturity, by numerous stellate fissures, into a number of narrow triangular segments. Asci rather numerous, about 20 in each thyriothecium, broadly ovate to subglobose, 4-6-spored, sessile, with a firm, rather thick wall, $27-30 \times 22-26\ \mu$; elongating at maturity and becoming narrow ovate, $35-45 \times 22-27\ \mu$. Spores conglobate, oblong to subclavate, rounded at both ends, 1-septate, slightly constricted, buffy brown, smooth, $16-20\ \mu$ long; upper cell broader and more broadly rounded, $9-10\ \mu$ long and $6-9\ \mu$ broad, lower $7.5-11\ \mu$ long, and $5-7.5\ \mu$ broad.

Pycnidia very numerous, scattered or in groups, often interspersed with the thyriothecia similar to the latter but smaller, $60-90\ \mu$ diam. Conidia ovate, ellipsoid, subglobose or angular and irregular in form, $12.5-17.5 \times 9-13\ \mu$, without lighter medial band, but with 4, rather conspicuous, equatorial germ pores.

. On *Clausena anisata* (Willd.) Hk. f. (= *Clausena inaequalis* Bth v. *abyssinica* Engl.) on leaves, Hilton Road, Natal, *Doidge*, 11606, Type; Buccleuch, near Cramond, *Sim*, 10149; Woodbush, *Doidge*, 1754, 17760, 28328.

41. *Asterina erysiphoides* Kalch. et Cke. emend. *Doidge*.

Kalch. & Cke., Grevillea IX (1880) p. 32, t. 137, fig. 42; *Doidge*, Trans. Roy. Soc. S. Afr. 8 (1920) pp. 256-257; Theissen Ann. Myc. 10 (1910) p. 16 and Die Gattung *Asterina* (1913) p. 25. [Plate XLV.]

Colonies amphigenous, in some collections predominantly hypophyllous, thin, sooty black, round to irregular, up to 6 mm. diam.; often numerous, becoming confluent, covering a large part of the leaf surface, or forming large irregular blotches, which are often along the veins and leaf margins.

Mycelium delicate, radiating, becoming more or less reticulate, especially near the centre of the colony, forming a loose network with rounded or angular mesh. Hyphae tawny olive to snuff brown, slightly undulating or tortuous, 3.5-5 μ thick, some secondary hyphae thinner, 2.5 μ thick; branches numerous, usually opposite; cells mostly 15-22.5 μ long. Hyphopodia alternate or unilateral, rarely opposite, usually 1-celled, erect or hooked, frequently broader than long, 5-10 μ long, 5-10 μ broad, usually with 2-5, mostly 3, broad, shallow rounded lobes, asymmetrical and irregular in form; rarely cylindrical, subglobose or clavate and entire or subentire; very rarely 2-3-celled, the septate hyphopodia being usually near the centre of the colony, 10-15 μ long, with 1-2-celled, cylindrical or slightly gibbous stipe, apical similar in form to the 1-celled hyphopodia and 3.5-7.5 μ broad.

Thyriothecia scattered or in small confluent groups, rarely 2-3 become completely fused, circular in outline or flattened laterally through contact, 100-130 μ diam. Basal membrane delicate, olive buff, fairly firm and composed of radiating hyphae 2.5-3 μ thick. Covering membrane convex, snuff brown, becoming darker and subopaque, firm, composed of radiating hyphae 2.5-3.5 μ thick, with cells 4-6 μ long; margin more or less fimbriate, with a fringe of paler, tortuous hyphae; rupturing at maturity, by means of stellate fissures, into a number of narrow, triangular segments. Asci not very numerous, ca. 10-12 in each thyriothecium, embedded in brownish, mucilaginous matter, 8-spored, subglobose or broadly ovate, sessile, with a firm, rather thick wall, 30-37.5 \times 26-35 μ . Spores conglobate, oblong, snuff brown, rounded at both ends, 1-septate, constricted, minutely verruculose-echinulate at maturity, 17-25 μ long; cells subglobose to oval, upper usually broader and more broadly rounded, 11-13 μ long and 10-12 μ broad, lower 10-11 μ long and 7.5-10 μ broad.

Pycnidia numerous, similar in form to the thyriothecia but smaller, 60-100 μ diam. Conidia snuff brown, with a somewhat lighter, poorly defined medial band, ovate or pyriform, 16-22 \times 10-15 μ .

On *Jasminum tortuosum* Willd., on leaves, Cape, *MacOwan* 1139, Type.

Jasminum angulare Vahl., Kentani, *Pegler* 1868, 9161; East London, *Doidge*, 12405; Pirie Forest, Kingwilliamstown, *Doidge*, 12265; Langholm Estates, Bathurst, *Doidge*, 2352; Alexandria, *Doidge*, 22367.

Jasminum multipartitum Hochst., Alice, *Doidge*, 10978; Springfield, Natal, *Medley* Wood, 9018; East London, *Doidge*, 12432; Tongaat, *van der Byl*, 6954.

No. 12432 differs slightly from the other collections, the hyphopodia are more deeply lobed and the proportion of 2-celled hyphopodia is larger.

Asterina erysiphoides Kalch. & Cke. (not Ell. & Mart) was described in Grevillea IX (1880) p. 32, the type collection being *MacOwan* 1139 on *Jasminum tortuosum*. In the *Annales, Mycologici* 10 (1912) p. 16, Theissen states that there are three collections under this name in the Kew Herbarium: the type collection *MacOwan* 1139, a second with the designation *Puccinia exhauriens* Thüm., and a third on *Barosma scoparia*, *MacOwan* 1260, from Grahamstown, the last being an immature *Meliola*. The type consists of an immature *Asterina* with light brown mycelium, of which the hyphae are 4-5 μ thick, and bear alternate hyphopodia 6-8 μ long and mostly 3-lobed. The immature thyriothecia have no asci, only brown stylospores with hyaline band, 18-22 μ long and 10-12 μ broad ("sporidiis ellipticis, continuis, atro-fuscis, 18-20 \times 10 μ " in the original diagnosis). Theissen concludes that the species should be ignored ("Die art is zu streichen").

There has evidently been some confusion in the labelling of *MacOwan*'s collections. The collection labelled *MacOwan* 1139 in the herbarium of the South African Museum, Capetown is *Puccinia exhauriens*, and no trace of an *Asterina* could be found on this material. *MacOwan* 1260 is *Meliola microthecia* Thüm. on *Barosma scoparia* (Bothalia II, 1928, p. 454).

The type collection at Kew, *MacOwan 1139*, is evidently the *Asterostomella*-stage of a species of *Asterina* which occurs fairly commonly in Natal and the Eastern Cape. A number of collections agree with the description of the mycelium and pycnidia made by Theissen from the Kew specimen and with the original description in Grevillea; several numbers show well developed thyriothecia, which were described by Doidge (loc. cit.). The name *Asterina erysiphoides* Kalch. & Cke. emend. Doidge should be retained for this fungus, which is evidently the species collected by MacOwan and described in Grevillea.

In Steyens and Ryan, *The Microthyriaceae* (1939) p. 24, *Asterina erysiphoides* K. & Cke. is given as a synonym for *Seynesia microthyrioides* (Wint.) Theiss., a fungus with no free mycelium occurring on Eucalyptus in Australia; for this there appears to be no justification.

42. *Asterina tertia* Rac., var. *africana* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 264, 277. [Plate XLVI.]

Colonies epiphyllous, numerous, thin, black, circular, up to 3 mm. diam., often numerous and tending to become confluent. Mycelium very loosely reticulate. Hyphae isabella colour to tawny olive, more or less deeply and regularly undulating, 3-4 μ thick, rarely up to 5 μ ; cells mostly 20-30 μ long; branching irregular, sometimes opposite. Hyphopodia fairly numerous, unilateral or alternate, rarely opposite, mostly 1-celled, irregularly lobed, 5-10 μ long, 6-12.5 μ broad, erect or hooked, with 2-5 irregular, rounded or retuse lobes, lobes rarely symmetrical; occasionally 2-celled with gibbous stipe, 10-12.5 μ long and 5-6.5 μ broad.

Thyriothecia very numerous, crowded, irregularly circular or oval in outline, 100-140 μ diam., rarely solitary, usually fused in groups of 2-5 or many, and forming larger, compound ascomata. Basal membrane olive buff to deep olive buff, formed of radiating hyphae 2-3 μ thick, delicate, not firmly compacted and readily falling apart under pressure. Covering membrane at first pellucid, isabella colour to tawny olive, slightly convex, becoming darker, subopaque and more definitely convex at maturity, composed of radiating hyphae 2.5-3 μ thick, cells 3.5-5 μ long; margin not fimbriate or rather sparsely so; at maturity breaking into a number of triangular segments through the formation of radiating stellate fissures, which run out almost to the margin. Asci very numerous, 20-30 or more in each thyriothecium, 8-spored, broadly ovate, subsessile, 30-35 \times 27.5-30 μ , embedded in an ochraceous mass of mucilaginous matter. Spores oblong, isabella colour to tawny olive, pellucid, 1-septate, constricted, broadly rounded at both ends, 16-18 \times 7.5-10 μ , rarely exceeding 9 μ in breadth; cells subglobose, equal in size, or the upper very slightly broader; minutely but very distinctly verruculose at maturity.

Pycnidia similar to the thyriothecia but smaller, 50-80 μ diam., Conidia ovate to pyriform, tawny olive, without paler medial band, less frequently oblong to globose, 11-18 \times 10-13 μ .

On *Hypoestes aristata* R. Br., on leaves, Inanda, *Medley Wood 608*, 9512; East London, *Doidge*, 10923.

Hypoestes verticillaris R. Br., Claridge, *Doidge*, 8998; Kentani, *Pegler 2317*, 9074. Van Staden's Pass, *Doidge*, 10856; Langholm Estates, Bathurst, *Doidge*, 12356; Entumeni, Zululand, *Haygarth*, 14149; Caradoc's Bush, Knysna, *Bottomley*, 32207.

Barleria obtusa Nees, Winkle Spruit, *Franks*, 9538.

Dicliptera clinopodia Nees, Lemana, Northern Transvaal, *Doidge*, 1791, Type; Pirie Forest, Kingwilliamstown, *Doidge*, 12270.

Dicliptera heterostegia Nees, Mayville, Durban, *Medley Wood*, 9028.

43. *Asterina diplocarpa* Cke.

Grevillea 10 (1882) p. 129; Theissen, *Die Gattung Asterina* (1913) p. 106; *Doidge*,

Trans. Roy. Soc. S. Afr. 8 (1920) p. 263.

Syn.: *Asterina similis* Cke., Grevillea 10 (1882) p. 130.

Seynesia Balansae Speg. var. *africana* Sacc., *Hedwigia* 38 (1899) p. (133); Syll. Fung. XVI, p. 649.

Asterina Balansae (Speg.) Theiss. var. *africana* (Sacc.) Th., *Die Gattung Asterina* (1913) p. 88; *Doidge*, Trans. Roy. Soc. S. Afr. 8 (1920) p. 257. [Plate XLVII.]

Colonies amphigenous, mostly epiphyllous, black, more or less circular, up to ca. 2.5 mm. diam.; usually very numerous on the upper side of the leaf, becoming confluent and covering the whole leaf surface.

Mycelium more or less reticulate; very closely reticulate and interwoven in the neighbourhood of the thyriothecia; meshes more or less rounded. Hyphae vinaceous buff to avellaneous or wood brown, deeply and rather regularly undulating, in places giving a zig-zag effect, $3.5\text{--}4\ \mu$ thick, rarely up to $5\ \mu$; cells mostly $15\text{--}25\ \mu$ long; branches numerous, usually alternate. Hyphopodia fairly numerous, 1-celled, alternate or unilateral, $5\text{--}7.5\ \mu$ long and $7\text{--}10\ \mu$ broad, irregularly lobed; the majority more or less erect and symmetrical, with 2-3 truncate, rounded or bilobulate lobes; the remainder hooked, with 2-4 rounded lobes on the convex side.

Thyriothecia very numerous, crowded, rarely discrete, more or less circular in outline, $100\text{--}150\ \mu$ diam.; mostly confluent or completely fused in groups of 2-4 or many, and forming irregular, compound ascumata. Basal membrane subhyaline to pale smoke grey, delicate, composed of radiating hyphae, which are loosely compacted and not always readily detected. Covering membrane convex, at first avellaneous to wood brown, pellucid, becoming darker and subopaque, formed of radiating hyphae $2.5\text{--}3\ \mu$ thick, central cells $3\text{--}5\ \mu$ long, those near the margin longer; margin not fimbriate or rather sparsely so; splitting at maturity, by radiating fissures, into a number of narrow, triangular segments. Asci rather numerous, 20-30 in each thyriothecium, 8-spored, ovate or subglobose, sessile, $34\text{--}42 \times 25\text{--}27.5\ \mu$, with a firm, rather thick wall slightly thickened, $1.5\text{--}6\ \mu$, round the apex. Spores conglobate, oblong, broadly rounded at both ends, 1-septate, deeply constricted, avellaneous to wood brown, closely and minutely verruculose, $15\text{--}16.5\ \mu$ long; upper cell subglobose, slightly broader, $7.5\text{--}9\ \mu$ diam., lower usually $7.5\text{--}8\ \mu$ broad.

Pycnidia numerous, similar to the thyriothecia but smaller, $70\text{--}90\ \mu$ diam. Conidia continuous, ovate or subglobose, wood brown without lighter medial band, $13.5\text{--}19 \times 12\text{--}14\ \mu$.

On *Sida rhombifolia* L., on leaves, Inanda, *Medley Wood* 544, 9505, 10192, (Type of *Asterina similis* Cke.).

Sida cordifolia L., Inanda, *Medley Wood* 601, Type, 9506, 10194; Van Staden's Pass, Doidge, 10858; Natal, *Medley Wood* 6464, 9507 (Type of *Seynesia Balansae* Speg. var. *africana* Sacc.); Durban, *van der Byl* 739.

The basal membrane of the thyriothecium is delicate in structure or composed of loosely radiating hyphae; no very compact membrane could be detected in the type or in the other collections examined. *Medley Wood* 6464 is not on *Rubus rigidus*, as stated by Saccardo (loc. cit.) but on *Sida cordifolia*, and agrees in every way with *Asterina diplocarpa* Cke.; in Theissen's monograph (loc. cit.) this collection is named *Asterina Balansae* Speg. var. *africana* and is included in the section Clypeolaster, "without basal membrane"; *Asterina diplocarpa* is placed in the section Clypeolaster, comprising species with basal membrane. The basal membrane in this species is delicate and loosely compacted, and it may probably be regarded as a transition form between the two sections.

43a. *Asterina diplocarpa* Cke. var. *Hibisci* Doidge nov. var.

Sub *Asterina diplocarpa* Cke., Trans. Roy. Soc. S. Afr. 8 (1920) p. 263.

Mycelium delicate, radiating irregularly, later becoming loosely reticulate with rounded meshes. Hyphae $2.5\text{--}3.5\ \mu$ thick, rarely up to $4\ \mu$, more or less deeply undulating; cells mostly $15\text{--}20\ \mu$ long; branches fairly numerous, alternate or opposite. Hyphopodia few, distant, alternate or unilateral, $5\text{--}11.5\ \mu$ long, $7.5\text{--}15\ \mu$ broad. Thyriothecia $100\text{--}130\ \mu$ diam. Asci not very numerous, ca. 10-12 in each thyriothecium, subglobose or broadly ovate, $25\text{--}33 \times 22.5\text{--}25\ \mu$. Spores $17\text{--}20\ \mu$ long; cells subequal in length, upper slightly broader, $9\text{--}10\ \mu$ broad, lower $7.5\text{--}9\ \mu$, minutely verruculose.

Pycnidia numerous, $70\text{--}80\ \mu$ diam. Conidia $16\text{--}18 \times 13\text{--}15\ \mu$. In other respects like the type.

On *Hibiscus pedunculatus* Cav., on leaves, Town Bush Valley, Pietermaritzburg, Doidge, 9710; East London, Doidge, 10927; Duncairn, near Pietermaritzburg, Doidge, 14952; Van Staden's Pass, Doidge, 17258, Type; Deepwalls, Knysna, *Bottomley*, 32126.

44. *Asterina Excoecariae* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 258, 274. [Plate XLVIII.]

Colonies amphigenous, thin, greyish black, poorly defined and irregular in outline, up to 8 mm. diam.

Mycelium delicate, reticulate, with angular meshes. Hyphae deep olive buff or avellaneous to wood brown, $3\text{--}3.5\ \mu$ thick, straight or slightly undulating; cells mostly

16–20 μ long; branches fairly numerous, usually opposite and at an angle of about 45° with the main hypha. Hyphopodia fairly numerous, unilateral or alternate, 1-celled, mostly erect, occasionally hooked, irregular in form, often broader than long, mostly 5–7 μ long, rarely up to 9 μ or 11 μ ; 5–10 μ , mostly 6–8 μ broad; mostly 2–3-lobed, with very shallow, broadly rounded lobes, occasionally more deeply lobed, rarely entire or subentire, obovate or bolster-shaped.

Thyriothecia scattered or more or less crowded, often confluent in groups of 2–3, round to irregular in outline, 150–200 μ diam. Basal membrane delicate, pale smoke grey, composed of radiating, loosely compacted hyphae, ca. 3–3.5 μ thick. Covering membrane slightly convex, pellucid, deep to dark olive buff, becoming darker, subopaque, composed of irregularly radiating hyphae 2.5–3 μ thick, which become tortuous near the margin; central cells almost cubical, 3–4 μ long, cells near the margin indistinctly septate and irregular in length; margin irregular but not fimbriate; splitting at maturity, by means of stellate fissures, into a number of triangular segments. Asci not very numerous, about 10–12 in each thyriothecium, 4-spored, broadly ovate to subglobose, sessile, with a firm, rather thick wall, 37–45 \times 31–42.5 μ . Spores conglobate, wood brown, oblong, broadly rounded at both ends, 1-septate, constricted, finely and closely verruculose-echinulate, 25–30 \times 12–14 μ ; cells subequal, or the upper broader and more broadly rounded.

Pycnidia numerous, similar to the thyriothecia but smaller, 60–90 μ diam. Conidia mostly ovate, less frequently subglobose or ellipsoid, buffy brown to olive brown, with or without an indistinct, lighter, medial band, 17.5–25 \times 15–20 μ , thick-walled, wall ca. 1.5 μ thick.

On *Drypetes arguta* Hutch., on leaves, Winkle Spruit, Natal, Doidge, 9009, Type.

This is another species of which the host plant was incorrectly named.

45. **Asterina Fleuryae** Doidge nov. spec. [Plate XLIX.]

Colonies epiphyllous, not producing leaf spots, minute, 1–2.5 mm. diam., inconspicuous and poorly defined, black, often numerous, becoming confluent and forming larger irregular blotches.

Mycelium loosely reticulate. Hyphae pellucid, olive buff to buffy brown, 3–4.5 μ thick, rather thin-walled, deeply undulating; cells mostly 20–25 μ long; branching irregular. Hyphopodia 2-celled, not numerous, alternate or unilateral, rarely opposite, straight, curved, hooked or uncinate, 9–19 μ long, more frequently erect than inclined towards the hyphae; basal cell cylindrical, straight or curved, 1.5–10 μ long, 3–4 μ thick, or gibbous and up to 7 μ thick; apical cell straight, uncinate, hooked or undulating, cylindrical, 3–4 μ thick, or irregularly 2–4-lobed, with rounded, rather shallow lobes, and up to 10 μ broad.

Thyriothecia fairly numerous, scattered or in groups; groups of 2–4 or more, which are in contact, often fuse laterally, forming larger, irregular, compound ascomata; single thyriothecia round to irregular in outline, 100–130 μ diam. Basal membrane smoke grey, fairly firm, radiating in structure, composed of radiating hyphae, 2.5–3.5 μ thick. Covering membrane at first concolorous with the hyphae, becoming dark olive brown, subopaque, convex, formed of radiating hyphae 3–3.5 μ thick, with cells 3.5–5 μ long near the centre, longer, up to 8 μ , near the margin; margin more or less fimbriate, fringing hyphae 2.5–3.5 μ thick, curved, tortuous; splitting at maturity, by means of stellate fissures, into a number of triangular segments. Asci fairly numerous, 8-spored, embedded in indistinctly fibrose, greyish brown, mucilaginous matter, ovate or subglobose, sessile, with a firm, rather thick wall, 25–35 \times 17–20 μ . Spores conglobate, oblong, dark olive buff, rounded at both ends, 1-septate, somewhat constricted, smooth, 12–15 \times 5–6.5 μ ; cells subequal or the upper slightly broader, both cells broadly oval, or the upper subglobose, shorter and broader than the lower, which is oblong.

Pycnidia numerous, similar to the thyriothecia but smaller, 60–90 μ diam. Conidia olive brown, with a poorly defined, lighter medial band, ovate, ellipsoid or pyriform, 11–16 \times 6.5–9 μ .

On *Fleurya* sp., on leaves, Woodbush, Doidge, 28349, Type.

46. **Asterina van der Bylii** Werd.

Rep. sp. nov. regni. veg. 19 (1923) p. 49. [Plate L.]

Colonies amphigenous, not on leaf spots, more numerous on the upper side of the leaf, thin, black, scattered, round to irregular in outline, 2–4 mm. diam.; often numerous,

becoming confluent, covering the whole upper surface of the leaf, and becoming continuous round the margin on the under side.

Mycelium more or less closely reticulate. Hyphae straight or very slightly undulating, $3.5\text{--}5\ \mu$ thick; younger hyphae drab grey, darkening with age to snuff brown; cells varying from $15\text{--}45\ \mu$ in length; branches opposite or alternate, usually at an acute angle with the main hyphae. Hyphopodia alternate, unilateral or opposite, 2-celled, rarely 1-celled, fairly numerous, $10\text{--}20\ \mu$ long; basal cell cylindrical, $3\text{--}10\ \mu$ long, $4\text{--}5\ \mu$ thick; apical cell $5\text{--}10\ \mu$ long, $5\text{--}9\ \mu$ broad, cylindrical or clavate, straight, hooked or more or less curved, entire or sublobed.

Thyriothecia comparatively rare and often absent, round or rather irregular in outline, $130\text{--}160\ \mu$ diam. Basal membrane pale smoke grey to light greyish olive, radiating, delicate but firmly compacted. Covering membrane slightly convex, at first snuff brown, becoming darker and subopaque, composed of radiating hyphae $2.5\text{--}3\ \mu$ thick, cells $4\text{--}5\ \mu$ long, or less frequently up to $7.5\ \mu$ long; margin briefly fimbriate, fringing hyphae paler, tortuous, $3\text{--}4\ \mu$ thick. Asci 8-spored, ovate, sessile, $30\text{--}35 \times 26\text{--}28\ \mu$. Spores conglobate, oblong, rounded at both ends, 1-septate, rather deeply constricted, snuff brown, very minutely verruculose, $17.5\text{--}20 \times 9\text{--}11\ \mu$; cells subglobose, upper slightly larger.

Pycnidia formed in great profusion, $50\text{--}75\ \mu$ diam., similar to the thyriothecia. Conidia ellipsoid to subclavate, snuff brown with an indistinct, lighter medial band, $17.5\text{--}20 \times 9\text{--}10\ \mu$.

On *Heteropyxis natalensis* Harv., on leaves, Krantzklouf, Natal, *van der Byl* 398, Type; Umzimkulu Gorge, Oribi Flats, near Port Shepstone, *McClean* 551, 31288; Springfield, Natal, *Medley Wood*, 9022; Krantzklouf, *Doidge*, 8254; Barclayvale, *Liebenberg*, 30459; south bank of the Sabie River, *Mogg*, 32230; Zimbabwe, S. Rhodesia, *van der Byl* 2470.

Werdermann gives the measurements of the ascospores as $15\text{--}17.5 \times 5\text{--}8\ \mu$; it is possible that the material he examined was immature, as he also states that the spores are smooth.

Heteropyxis ruto-rhamnoides, stated to be the host of *van der Byl* 2470, is identical with *H. natalensis*; the latter is a very variable species and the name *H. ruto-rhamnoides* was given to one of its numerous forms, but the name was not published.

47. *Asterina peraffinis* Speg.

Fung. Puigg. 355 (1889); Sacc. Syll. Fung. IX, p. 392; Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) p. 259.

Syn.: *Asterina pseudopelliculosa* Speg. var. *peraffinis* (Speg.) Th. Die Gattung *Asterina* (1913) p. 104. [Plate LI.]

Colonies amphigenous, not on leaf spots, thin, greyish black, round to irregular in outline, up to $7.5\ \mu$ diam., often becoming confluent; becoming more conspicuous after the formation of numerous thyriothecia, which appear as a thick powdering of black on the greyish spots.

Mycelium more or less reticulate. Hyphae deep to dark olive buff, older hyphae occasionally buffy brown, pellucid, straight or slightly undulating, $3\text{--}5\ \mu$ thick; branching irregular. Hyphopodia not very numerous, alternate or unilateral, 2-celled, only occasionally 1-celled, straight or more or less curved, at various angles with the hypha or closely appressed towards it, $10\text{--}20 \times 8\text{--}12.5\ \mu$, irregularly, often palmately 3-4-lobed, lobes rounded or truncate; often obliquely septate between the first and second lobes and thus forming a gibbous basal cell; basal cell rarely cylindrical.

Thyriothecia very numerous and thickly scattered, small groups of 2-4 often closely crowded and becoming more or less connate, round, brown, $120\text{--}160\ \mu$ diam. Basal membrane firm, olive buff to deep olive buff, composed of radiating hyphae $2.5\text{--}4\ \mu$ thick. Covering membrane convex, up to $75\ \mu$ high in the centre, at first deep olive buff, then buffy brown to olive brown, pellucid, rather loosely compacted of straight, radiating hyphae, $2.5\text{--}4\ \mu$ thick, central cells almost cubical, $2.5\text{--}4\ \mu$ long, peripheral cells somewhat longer, $5\text{--}8\ \mu$ long; early becoming split into a number of triangular segments by means of irregularly stellate fissures, which reach almost to the margin; margin fimbriate, fringing hyphae paler, $3\text{--}4\ \mu$ thick, almost straight or more or less tortuous and up to $25\ \mu$ long. Asci embedded in olive ochre mucilaginous matter, ovate, subglobose or broadly ellipsoid, 8-spored, sessile, thin-walled, somewhat thickened, up to $3\ \mu$, round the apex, $30\text{--}40 \times 22.5\text{--}30\ \mu$; fairly numerous, up to 12, in each thyriothecium. Spores conglobate, pellucid, buffy brown to olive brown, oblong, broadly rounded at both ends, 1-septate, constricted, smooth, $17.5\text{--}20\ \mu$ long; cells subglobose to broadly ellipsoid, upper larger, $10\text{--}12.5\ \mu$ long and $8.5\text{--}10\ \mu$ broad, lower $7.5\text{--}8.5\ \mu$ long and $6\text{--}7.5\ \mu$ broad.

Pycnidia numerous, similar to the thyriothechia but smaller, about $70\ \mu$ diam. Conidia ovate to pyriform, dark olive buff, continuous, without a hyaline band, $17-20 \times 6-10\ \mu$.

On *Tylophora Flanaganii* Schlecht., on leaves, Lemana, Northern Transvaal, Doidge, 1804; Brander's High Forest, Victoria East, van der Byl, 9458; Pirie Forest, Kingwilliams, town, Doidge, 12304; Hoek van Helbosch, N. Transvaal, Burt Davy, 15498; West Wood, Haenertsburg, Doidge, 17721; Woodbush, Doidge, 28345 and van der Byl 1653.

48. *Asterina radio-fissilis* (Sacc.) Theiss.

Ann. Myc. 10 (1912) p. 22; Die Gattung *Asterina* (1913) p. 97.

Syn.: *Dimerium radio fissilis* Sacc., Fungi aliquot afr., Bol. Soc. Brot. 21 (1904) p. 21.

Asterina natalensis Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) pp. 248, 275.

Sub *Asterina tenuis* Wint., in Trans. Roy. Soc. S. Afr. 8 (1920) p. 250. [Plate LII.]

Colonies amphigenous, mostly epiphyllous, not on leaf spots, black, small, circular to irregular in outline, up to 2 mm. diam., often becoming confluent and forming larger, irregular blotches.

Mycelium loosely reticulate, composed of undulating hyphae, which are dark olive buff to buffy brown, $3.5-4\ \mu$ thick, with cells mostly $15-25\ \mu$ long; branching irregular. Hyphopodia fairly numerous, alternate or unilateral, rarely opposite, mostly 2-celled, rarely continuous, $10-15\ \mu$ long, occasionally up to $20\ \mu$, $6-10\ \mu$ broad, straight, curved or hooked; basal cell cylindrical or gibbous, $2-5\ \mu$ long, $3.5-4.5\ \mu$ thick, rarely up to $6\ \mu$ thick; apical cell irregular in shape, usually with 2-4 blunt lobes, rarely subentire and club-shaped.

Thyriothechia numerous, often crowded, round to irregular in outline, or becoming angular when two or more contiguous thyriothechia become fused, $100-140\ \mu$ diam. Basal membrane smoke grey to greyish olive, radiating in structure, formed of hyphae about $2.5\ \mu$ thick. Covering membrane slightly convex, buffy brown to olive brown, often subopaque, formed of radiating hyphae $2-3\ \mu$ thick, cells $3-5\ \mu$ long; margin not fimbriate or sparsely so; splitting at maturity into a number of triangular segments, by means of stellate fissures which run out almost to the margin. Asci fairly numerous, ovate, sessile, 8-spored, $27.5-32.5 \times 23-25\ \mu$. Spores conglobate, buffy brown, oblong, 1-septate, slightly constricted, minutely verruculose, $15-19 \times 7-9\ \mu$; cells subequal.

Pycnidia similar to the thyriothechia but smaller, $60-80\ \mu$ diam. Conidia ellipsoid to ovate, buffy brown with a lighter medial band, $11-15 \times 7-9\ \mu$.

On *Erythrococca berberidea* Prain, on leaves, near Durban, Medley Wood 6458b, 9524b.

Ctenomeria capensis (Thunb.) Harv., Winkle Spruit, Doidge, 9001 (Type of *Asterina natalensis*); van Staden's Pass, Doidge, 17259.

Dalechampia capensis Spreng., Amanzimtoti, Doidge, 1638; Winkle Spruit, Doidge, 9003.

Acalypha decumbens Thunb., van Staden's Pass, Doidge, 10862

According to Theissen (loc. cit.) the type of *Asterina radio-fissilis* is Medley Wood 6452. on *Kraussia coriacea*; it has lobulate hyphopodia and spores $17-19 \times 8-10\ \mu$; var. *macrospora*, Medley Wood 6458, on leaves of an unknown tree, has spores $25-28 \times 11-13\ \mu$. Both these collections of Medley Wood are to be found under the name *Asterina tenuis* in various herbaria.

The material distributed under the numbers quoted evidently consists of a mixture of leaves from different hosts. The portion of Medley Wood 6452 in the herbarium at Pretoria is certainly *Kraussia coriacea*, but the fungus on these leaves has node cells and not typical hyphopodia (see *Asterolibertia megathyria*), and is certainly not the *Asterina* described by Theissen. Under Medley Wood 6458 are included leaves of two entirely different plants; one is a *Capparis* sp. (see *Asterina Woodii*) and the other is *Erythrococca berberidea*. The latter host was erroneously recorded as *Claoxylon* sp. in a previous paper (Doidge l.c.) and Theissen's reference to Medley Wood's collection was unfortunately overlooked.

There can be no doubt, from Theissen's description and drawings, that *Asterina radio-fissilis* is the fungus on *Erythrococca*, the fungus on *Capparis* being an *Asterina* with entire, cylindrical and usually uncinuate hyphopodia. *A. radio-fissilis* cannot be distinguished from *A. natalensis* Doidge, and the latter must be regarded as a synonym; the host of the type collection of the latter fungus is not *Mikania* sp., as originally stated, but *Ctenomeria capensis*. The fungus on *Acalypha* is identical with collections of *A. radio-fissilis* on other hosts, and not with the related species *Asterina Acalyphae* Syd.

49. *Asterina africana* (van der Byl) Doidge nov. comb.

Syn.: *Asterina celidicola* P. Henn. v. *microspora* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) p. 260.

Parasterina africana van der Byl, S. Afr. Jour. Sci. 26 (1929) p. 319. [Plate LIII.]

Amphigenous, forming very numerous, small, indefinite, greyish black spots, which frequently cover a large part of the leaf surface; most numerous along the veins and under the margin of the leaf.

Mycelium more or less closely reticulate. Hyphae straight or more or less undulating, pellucid, tawny olive to snuff brown, 3–5 μ thick, rather indistinctly septate, branching irregular. Hyphopodia alternate, 2-celled, occasionally 1- or 3-celled, slightly curved, uncinate or bent abruptly at right angles (boot-shaped), rarely straight and club-shaped, entire or with 2–3 short, rounded or truncate lobes, 10–17.5 μ long and 4–10 μ broad; basal cell more or less cylindrical, 4–7.5 μ long.

Thyriothecia numerous, thickly scattered, not infrequently in contact with one another and becoming connate in large or small groups, circular, slightly elongated or somewhat angular in outline, 100–150 μ diam. Basal membrane not conspicuous, delicate, subhyaline to dark olive buff, formed of rather loosely compacted, radiating hyphae, ca. 3 μ thick. Covering membrane convex, tawny olive then snuff brown, becoming subopaque, composed of straight, radiating hyphae 2.5–3.5 μ thick, cells 5–7.5 μ long; early splitting into narrow triangular segments through the formation of radiating stellate fissures; margin not fimbriate or sparsely so, a few hyphae being prolonged into paler, tortuous hyphae up to about 60 μ long. Asci numerous, up to 30 in each thyriothecium, broadly ovate to subglobose, sessile, 8-spored, 26–33 \times 22–30 μ . Spores conglobate, tawny olive to snuff brown, oblong, broadly rounded at both ends, 1-septate, constricted, closely and rather conspicuously verruculose-echinulate, 16–20 μ long; cells of approximately equal length, subglobose to broadly ellipsoid, upper usually broader, 8–10 μ broad, lower 7.5–9 μ .

Pycnidia closely associated with the thyriothecia and similar in form but smaller, 60–100 μ diam. Conidia oblong or ovate, continuous, snuff brown with a hyaline, medial band, 14–20 \times 8–12.5 μ .

On *Xylothea Kraussiana* Hochst., Durban, *H. Forbes* (van der Byl 2527), Type; Stella Bush, Durban, Bottomley, 11376, 11382, 11378; Stella Bush, van der Byl 742, 11361 and Schilz 14706; Durban, Bottomley 11897, 11898, Pole Evans 11899 and Franks 8405; Durban, van der Byl 110; Winkle Spruit, Doidge, 9004, 9012; Amanzimtoti, Doidge, 1683; Berea, Durban, Morgan and Doidge, 32157.

Oncoba sp., Rikatli, Mozambique, Junod, 11731, 11732.

In a previous paper (Doidge, loc. cit.) this fungus was described as *Asterina celidicola* var. *microspora* on *Maerua* (3 numbers) and *Oncoba Kraussiana* (2 numbers); the host in each case is *Xylothea Kraussiana* Hochst., for which *Oncoba Kraussiana* is a synonym. *Parasterina africana* van der Byl was said to be on *Cola natalensis*, but the host of the type specimen is not this plant but *Xylothea Kraussiana*.

Asterina africana has a distinct basal membrane to the thyriothecia and differs from *Asterina celidicola* in a number of other particulars.

49a. *Asterina africana* (van der Byl) Doidge var. *Kiggelariae* Doidge nov. var.

Sub *Asterina celidicola* P. Henn. var. *microspora* Doidge in Bothalia 1 (1924) p. 204.

Colonies always epiphyllous. Mycelium composed of radiating, irregularly branched hyphae, which become loosely reticulate; rather closely reticulate near the centre of the colony, where there is a tendency for two or more hyphae to run parallel and become connate. Hyphae and hyphopodia similar to those of the type; hyphopodia occasionally opposite, 8–20 μ long, 6–9 μ broad; basal cell more or less cylindrical, rarely gibbous, 3–12.5 μ long and 3–5 μ thick; terminal cell as in the type.

Basal membrane of thyriothecia subhyaline, delicate, readily breaking down and difficult to detect; covering membrane consisting of straight, radiating hyphae 2–3 μ thick, cells ca. 4–5 μ long in the centre, slightly longer near the sparsely fimbriate margin. Asci not very numerous, 6–12 in each thyriothecium, 27.5–35 \times 25–32.5 μ . Spores slightly broader than those of the type, upper cell 8.5–11 μ broad, very minutely verruculose at maturity.

Conidia somewhat smaller than those of the type, 10–17.5 \times 8.5–11.5 μ .

On *Kiggelaria africana* L., on leaves, Keurkloof Forest, George, Doidge, 17111, Type; Storm's River, Humansdorp District, Doidge, 17191; Deepwalls, Knysna, Doidge, 17221; Woodbush, Doidge, 17748; Montagu Pass Road, George, Doidge, 17104.

50. *Asterina elegans* Doidge nov. spec.

Sub *Asterina sphaerasca* Thüm., in Trans. Roy. Soc. S. Afr. 8 (1920) p. 262. [Plate LIV.]

Colonies mostly epiphyllous, black, often circular in outline and up to 5 mm. diam., sometimes confluent and covering larger areas of the leaf surface.

Mycelium reticulate. Hyphae tawny olive to cinnamon brown, the primary hyphae finally becoming subopaque, straight or slightly undulating, 3–6 μ thick, cells 20–35 μ long, branching irregular. Hyphopodia numerous, opposite, alternate or unilateral, occasionally three arise from one hyphal cell and are in a whorl or placed irregularly, at right angles to the hypha or inclined towards it, 2-celled, cylindrical, straight or slightly curved, 12–20 μ long, 4–6 μ broad; basal cell cylindrical, 5–7.5 μ long; terminal cell cylindrical, tapering somewhat to the rounded apex, or constricted near the apex.

Thyriothecia numerous, thickly scattered, more or less circular in outline, 130–170 μ diam.; basal membrane pale smoke grey to deep olive buff, composed of radiating hyphae 3–5 μ diam.; covering membrane convex, cinnamon brown to russet, becoming opaque in the centre, composed of straight, radiating hyphae 3–4 μ thick, cells 3.5–4 μ long in the centre, somewhat longer near the fimbriate margin; splitting at maturity, by stellate fissures, into numerous narrow, triangular segments. Asci not numerous, subglobose to ovate, sessile, 8-spored, thick-walled, especially when immature, 45–50 \times 35–42 μ . Spores conglobate, cinnamon brown when mature, oblong, broadly rounded at both ends, 1-septate, constricted, 22–25 μ long; cells approximately equal in length, ellipsoid to subglobose, upper 11–12.5 μ broad, lower 9–10.5 μ broad; very coarsely and conspicuously verruculose-echinulate at maturity, with spinules up to 1.5 μ long.

Pycnidia similar to the thyriothecia but smaller, 100–120 μ diam. Conidia ovate, tawny olive to cinnamon, without hyaline band, 20–25 \times 12–15 μ .

On *Capparis citrifolia* Lam., on leaves, Winkle Spruit, Doidge, 9010, Type.

Capparis Gueinzii Sond., Bluff, Durban, Morgan and Doidge, 32155.

51. *Asterina capparidicola* Doidge nov. spec. [Plate LV.]

Colonies amphigenous, but more numerous and better developed on the upper side of the leaf, numerous, black, at first minute, 1–3 cm. diam., round to irregular, more or less scattered; later becoming confluent and forming irregular blotches, which cover a large part of the leaf surface; rarely there are discrete, irregularly circular colonies up to 5 mm. diam.; occasionally cauliculous.

Mycelium closely reticulate. Hyphae almost straight or somewhat undulating, about 5 μ thick, closely articulated, tawny olive to snuff brown, copiously branched, two or more hyphae often running parallel and becoming connate, frequently forming, with the hyphopodia, especially near the centre of the colony, an almost continuous, compact mycelial layer. Hyphopodia very numerous, usually opposite, at right angles to the hypha or inclined towards it, 2-celled, straight, somewhat curved or abruptly bent, ovate or briefly clavate, 10–15 μ long and 5.5–7.5 μ broad; basal cell cylindrical, ca. 5 μ thick, usually 2–3 μ long, but sometimes up to 6 μ ; apical cell subglobose or briefly cylindrical, broadly rounded at the apex.

Thyriothecia thickly scattered and usually associated with numerous pycnidia, more or less circular in outline, 110–140 μ diam., often coalescing in groups of 2–8. Basal membrane smoke grey to deep olive buff, composed of radiating hyphae 2–3.5 μ thick. Covering membrane convex, up to 40 μ high in the centre, composed of straight or slightly undulating, radiating hyphae 3–4 μ thick, with cells 2–4 μ long, almost cubical, but near the centre broader than long; margin fimbriate with a fringe of tortuous, paler hyphae 3.5–4 μ thick and up to 150 μ long, or, in the denser parts of the mycelium, not fimbriate; pellucid, at first snuff brown to bistre, later becoming almost black, opaque; early breaking into rather broad, irregular, triangular segments, through the formation of stellate cracks, often breaking away in the centre and exposing the asci. Asci globose or broadly ovate, sessile, 8-spored, 32–43 \times 27.5–37.5 μ . Spores conglobate, dark olive buff to tawny olive, oblong, broadly rounded at both ends, constricted at the septum, 22–27.5 μ long; upper cell larger, 12.5–15 μ long and 11.5–13.5 μ broad, lower 10–12.5 μ long and 10–11.5 μ broad; minutely and evenly, or rather conspicuously verruculose-echinulate at maturity.

Pycnidia similar to the thyriothecia but smaller, up to 100 μ diam. Conidia tawny olive to snuff brown, with or without an indistinct, lighter medial band, ovate to oblong, 17–25 \times 12–15 μ .

On *Capparis Zeyheri* Turcz., on leaves and stems, Alexandria, *Doidge*, 22360, 22361 Type; Van Staden's Pass, *Doidge*, 17254.

Capparis citrifolia Lam., Ebb and Flow, Wilderness, *Doidge*, East London, *Doidge*, 12416.

Capparis ?volkameriae, Witklip, Port Elizabeth, *van der Byl* 2492.

52. *Asterina Woodii* Doidge nov. spec. [Plate LVI.]

Colonies amphigenous, scattered, thin, black, irregularly circular in outline, rather more numerous and better developed on the lower than on the upper surface; single colonies up to 6 mm. diam., often becoming confluent and covering a large part of the leaf surface.

Mycelium consisting of hyphae which are rather remotely branched and more or less reticulate. Hyphae pellucid, ochraceous tawny, straight or slightly undulating, 3–5 μ thick, cells 15–35 μ long; not infrequently two or more hyphae run closely parallel and become connate. Hyphopodia not very numerous, often rather remote, opposite, alternate or unilateral, usually inclined towards the hypha, less frequently at right angles to it, 2-celled, 10–17.5 μ long, 3.5–5 μ broad, cylindrical to subclavate, more or less uncinuate or sinuous, rarely sublobed; basal cell more or less cylindrical, 2.5–10 μ long.

Thyriothecia numerous, thickly scattered, single, or very often in small, closely crowded groups of 2–8, 120–160 μ diam., circular in outline or becoming irregular through lateral pressure. Basal membrane pale smoke grey to light greyish olive, composed of radiating hyphae 2.5–3 μ thick, which are firmly or rather loosely compacted. Covering membrane ochraceous tawny to cinnamon brown, convex, composed of almost straight, radiating hyphae, 2–3 μ thick; cells 4–5 μ long in the centre, somewhat longer towards the margin, which has a fringe of tortuous hyphae 2.5–3 μ thick; at first closed, splitting at maturity into a number of triangular segments, by means of radiating, stellate fissures, some of which reach the margin. Asci comparatively numerous, 8–10 in each thyriothecium, ovate to subglobose, 8-spored, sessile, rather thick-walled, 30–37.5 \times 22.5–27.5 μ , embedded in a mass of olive ochre mucilaginous matter. Spores conglobate, oblong, rounded at both ends, 1-septate, deeply constricted, cinnamon brown, subopaque, 22.5–25 \times 10–12.5 μ ; almost black and conspicuously echinulate at maturity; each cell ellipsoid to ovate, the upper slightly larger.

On *Capparis Gueinzii* Sond., Natal, *Medley Wood* 6458a, 9524a, Type.

This is a part of the collection labelled "*Asterina tenuis*, *Medley Wood* 6458": for a discussion of this material see *Asterina radio-fissilis*.

53. *Asterina Rinoreae* Doidge nov. sp.

Sub *Asterina vagans* Speg., Trans. Roy. Soc. S. Afr. 8 (1920) p. 261.

Sub *Asterina vagans* Speg. var. *subreticulata* Theiss., in Stevens and Ryan^e, The Microthyriaceae (1939) p. 69. [Plate LVII.]

Colonies amphigenous, minute or more or less effuse, thin, greyish black, not conspicuous; more numerous and better developed on the upper side of the leaf.

Mycelium loosely reticulate. Hyphae irregularly branched, tawny olive, ca. 5 μ thick, almost straight or somewhat undulating, cells 25–30 μ long. Hyphopodia fairly numerous, alternate or unilateral, 2-celled, straight and erect, or curved or hooked and inclined towards the hypha, 9–17.5 μ long; basal cell more or less cylindrical, ca. 5 μ thick, straight or bent, rarely gibbous, 3–6 μ long, occasionally up to 12.5 μ long; terminal cell asymmetrical, often irregularly 2–3-lobed, lobes rounded or truncate, 8–11.5 μ broad.

Thyriothecia irregularly scattered, round or somewhat irregular in outline, 100–160 μ diam. Basal layer delicate, olive buff, formed of rather loosely compacted, radiating hyphae. Covering membrane slightly convex, formed of straight, radiating hyphae 3–3.5 μ thick, cells 5–7.5 μ long; early splitting, by stellate fissures, into numerous, narrow, triangular segments and breaking away in the centre, leaving the developing asci exposed; margin rather sparsely fimbriate, the fringing hyphae being more or less tortuous near the thyriothecium and then straight, paler 3.5–4 μ thick and up to 250 μ long. Asci ovate to subglobose, sessile, 8-spored, 33–37 \times 33–35 μ . Spores conglobate, oblong, broadly rounded at both ends, 1-septate, constricted, at first pellucid, tawny olive, darker when mature, 20–24 \times 11–12.5 μ , conspicuously verruculose-echinulate at maturity, spinules up to 1 μ long; cells subglobose, equal or the upper slightly broader.

Pycnidia similar to the thyriothecia but smaller, 50–60 μ diam. Conidia brown, with an obscure, lighter medial band, ovate to pyriform, 15–18 \times 10–11 μ .

On *Rinorea natalensis* Engl., on leaves, Buccleuch, near Cramond, Doidge, 9704, fungus Type 11581.

This fungus has now been compared with a specimen of *Asterina vagans* on *Tournefortia volubilis* (Syd. Fung. exot. exsic. 849) and although it is evidently a closely related species, it is not identical with the American species which occurs on Solanaceae. It is more compact in habit, with stouter hyphae, the spores more coarsely and conspicuously echinulate and the radiating hyphae composing the covering membrane of the thyriothechia more slender. There are also other minor differences.

Abundant material of the host was collected, but colonies of the fungus are not numerous on the leaves. *Asterina Rinoreae* is associated with *Irene Rinoreae*, which occurs on the same leaves.

CLYPEOLELLA v. Höhn.

Fragm. zur Myk. No. 478 (1910).

cf. Theissen in Centr. Bakt. II Abt. (1912) p. 229.

Superficial mycelium present, with hyphopodia and 4-celled conidia. Thyriothechia dimidiate, scutate, flat; covering membrane radial in structure, composed of one layer of cells, dehiscing from the centre. Hypothecium flat, filamentous. Hymenium simple, polyascous. Spores 2-celled, usually brown, sometimes almost hyaline.

KEY TO SOUTH AFRICAN SPECIES.

- | | |
|--|----------------------------|
| A.—Thyriothechia 320–400 μ diam. Spores 23–32 \times 11.5–14 μ | 1. <i>C. Psychotriae</i> . |
| B.—Thyriothechia 225–300 μ diam. Spores 20–25 \times 10–12.5 μ | 2. <i>C. rhamnocola</i> . |

1. *Clypeolella Psychotriae* Doidge nov. comb.

Syn.: *Calothyrium Psychotriae* Doidge (not Ryan) Bothalia I (1922) p. 76. [Plate LVIII.]

Colonies hypophyllous, thin, olive brown, scattered, often developing on the veins, more or less circular in outline, not sharply defined, ca. 8–12 mm. diam., sometimes fairly numerous and becoming confluent.

Mycelium loosely or more closely reticulate, forming a network with angular meshes. Hyphae deep to dark olive buff, almost straight or slightly sinuous, 4–5 μ thick, obscurely and rather remotely septate, cells 25–40 μ long, branching irregular. Hyphopodia not numerous, alternate or unilateral, often distant, 1-celled, pyriform pulvinate or sublobed, often trilobulate and broader than long, 7.5–12.5 μ long and 9–10 μ broad.

Thyriothechia sometimes scattered, but more frequently rather closely crowded and often becoming confluent in groups, more or less circular in outline, 320–400 μ diam., often flattened and irregular in shape as a result of mutual lateral pressure. Covering membrane delicate, pellucid, olive buff, slightly convex, formed of radiating hyphae 4–5 μ thick, cells varying in length from 5–15 μ , margin entire, more or less crenate, not fimbriate. Asci fairly numerous, 8-spored, subglobose to ovate, broadly rounded above, sessile, 40–53 \times 35–40 μ . Paraphysoids fibrose, hyaline, more or less persistent. Spores conglobate, oblong, broadly rounded at both ends, 1-septate, not constricted or very slightly so, smooth, rather thick-walled, hyaline, tardily becoming tinted deep olive buff, 23–32 \times 11.5–14 μ ; cells subequal or the upper slightly shorter and broader.

Conidia borne at the tips of short lateral branches of the hyphae, 3-septate, hyaline to olive buff, more or less cylindrical, straight, slightly curved or abruptly bent near the base, broadly rounded above or subacute, basal cell tapering to a truncate base, 45–55 \times 11.5–12.5 μ .

On *Psychotria capensis* Vatke, on leaves, Amanzimtoti, Natal, Doidge, 1575 (associated with *Meliola littoralis* Syd., on the same leaves).

The mycelium is hyphopodiate, and not as stated in the original description (Doidge loc. cit.). Apparently mature spores in the ascus are quite hyaline, but spores lying free on the leaf surface become tinted and are almost as dark as the hyphae. It seems not unusual in species of this genus, for spores in the ascus to remain hyaline, probably becoming coloured later, e.g. *Clypeolella Anisophyllae* Syd. (Ann. Myc. 36, 1938, p. 190) and *Cl. Alphonisae* Syd. (Ibid. 35, 1937, p. 42). In the latter species, the conidia are described as being also hyaline.

2. *Clypeolella rhamnicola* Doidge nov. comb.Syn.: *Asterina rhamnicola* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) pp. 255, 277.

Plate LIX.

Colonies epiphyllous, thin, greyish black, more or less circular in outline, up to 7 mm. diam., scattered, often numerous, becoming confluent and then covering the greater part of the leaf surface.

Mycelium radiating, becoming loosely reticulate with angular meshes. Hyphae mostly straight, dark olive buff to buffy brown, 5–7 μ thick, cells mostly 20–30 μ long; branches numerous, irregular, often opposite. Hyphopodia alternate or unilateral, briefly cylindrical or subglobose, 6–11 μ long and 6–10 μ broad.

Thyriothecia not very numerous, scattered or confluent in small groups of 2–3, formed at the tips of short hyphal branches, more or less circular in outline, 225–300 μ diam. Basal layer hyaline, delicate, structure not evident. Covering membrane slightly convex, delicate, pellucid, deep to dark olive buff, paler than the mycelium, composed of thin-walled, irregularly radiating, rather sinuous hyphae, 3–5 μ thick, septations obscure; margin entire, more or less crenate but not fimbriate; central cells breaking down irregularly at maturity. Asci very numerous, 20–50 in each thyriothecium, often visible through the pellucid covering membrane, 8-spored, broadly ellipsoid to ovate, sessile, 45–55 \times 23–37.5 μ . Spores buffy brown, oblong, broadly rounded at both ends, 1-septate, slightly constricted, smooth, 20–25 μ long; cells subequal in length but upper broader, upper cell 10–12.5 μ broad, lower 8–10 μ .

Conidia fairly numerous in some collections (especially in Nos. 14135 and 28343) borne singly at the tips of short hyphal branches, more or less fusoid to sublunate, 40–45 μ long, 12–15 μ broad at the centre or nearer the upper end, tapering to both ends, which are obtuse and 6.5–7.5 μ thick, more or less curved, the curvature being greatest near the ends; on germination, mycelial hyphae develop directly from both ends.

On *Rhamnus prinoides* L'Herit., on leaves, Woodbush, Doidge, 1752, Type; Woodbush, Doidge, 17737, 28341; Kentani, Pegler 2315, 2287, 9968; Pirie Forest, Kingwilliamstown, Doidge, 12294; Brander's High Forest, Victoria East, van der Byl, 9463a; Deepwalls, Knysna, Doidge, 17214; Keurkloof Forest, George, Doidge, 17115; Storm's River, Doidge, 17179; near Mont-aux-Sources, Doidge, 14135; Lundie's Hill, Umkomaas Valley near Bulwer, Doidge, 30509; Marwaqa Forest, near Bulwer, Morgan and Doidge, 30900; Knysna, van der Byl 400, 2274, 2281.

ASTEROLIBERTIA Arnaud.

Ann. de l'École Nat. d'Agric. de Montpellier, nouv. sér. 16 (1918) p. 165.

Mycelium with node cells or intercalary stigmocysts, without hyphopodia. Thyriothecia similar to those of *Asterina*, no definite basal membrane. Typical paraphyses wanting. Spores 2-celled, brown.

KEY TO SOUTH AFRICAN SPECIES.

A.—Node cells conspicuous.

(a) Node cells alternating regularly with cylindrical hyphal cells, 7.5–10 μ thick.1. *A. megathyria*.(b) Node cells distant and irregular, 5–8 μ thick.1a. *A. megathyria*,
var. *Randia*.

B.—Node cells inconspicuous, only slightly broader than the cylindrical hyphal cells

2. *A. Burchelliae*.1. *Asterolibertia megathyria* Doidge nov. comb.

As *Asterina gibbosa* Gaill. var. *megathyria* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) p. 248. [Plate LX.]

Colonies mostly epiphyllous, but occasionally hypophyllous, scattered, more or less circular in outline, black, crustaceous, up to 3 mm. diam.

Mycelium radiating. Hyphae isabella colour, more or less undulating, 5–6 μ thick, cells 8–15 μ long, or up to 25 μ long in the younger parts of the mycelium, branching irregular, often opposite. Node cells alternating with cylindrical hyphal cells with fair regularity, barrel-shaped to subglobose, often asymmetrical, 7.5–10 μ broad.

Thyriothecia very numerous, densely crowded in the centre of the colony, rarely discrete; separate thyriothecia more or less circular in outline, 140–200 μ diam.; thyriothecia usually crowded, becoming irregular in outline through lateral pressure and fusing in large groups of 6–20 in small colonies, and over 100 in the larger colonies. The mass of thyriothecia often covers the whole centre of the colony and is surrounded by a fringe of radiating hyphae;

less frequently the thyriothecia form an irregular ring round the more or less open centre. Basal layer delicate, subhyaline, structure not evident. Covering membrane convex, Saccardo's umber, becoming darker and subopaque at maturity, formed of straight, radiating hyphae, 2-3 μ thick, central cells almost cubical, 3-3.5 μ long, marginal cells up to 5 μ long; margin not fimbriate; dehiscing at maturity by irregular, stellate fissures. Asci ovate to clavate-cylindrical, 6-8-spored, sessile, with a firm, rather thick wall, which is slightly thickened round the apex, 27-40 \times 15-20 μ . Spores conglobate, oblong, rounded at both ends, 1-septate, slightly constricted, deep olive buff, smooth, thin-walled, 16-20 μ long; upper cell subglobose, 8-9 μ diam., lower ellipsoid, 9-12 μ long and 8 μ broad. Germinating spores give rise to a single hyphopodium, which is irregularly 3-5-lobed, 12-17 μ long and 10-15 μ broad; thereafter the spore collapses and two or more hyphae develop from the base of this hyphopodium, growing out to form the mycelium.

On *Tricalysia lanceolata* (Sond.) Burt Davy, on leaves, Amanzimtoti, Doidge 1576; Winter's Kloof, Doidge, 1624, 8987; Kentani, Pegler, 8787; Claridge, Doidge, 8992; Durban, Medley Wood, 9027; Town Bush Valley, Doidge, 9707; Buccleuch near Cramond, Doidge, 9708 Type, and Sim, 10151; Umkomaas, Bottomley, 11887; Duncairn, near Maritzburg, Doidge, 14957.

Tricalysia sonderiana Hiern. (= *Kraussia lanceolata* Sond.) Natal, Medley Wood 6452 (sub *Asterina tenuis* q.v.) 334, 9522; Krantzklouf, Doidge, 8985.

Since describing this fungus as a variety of *Asterina gibbosa* Gaill., a more careful comparison has been made with a portion of the type collection of that species (Rabh. Wint. Fung. Eur. 4054, collected in Brasil). This fragment is immature, but it is sufficient to show that, although closely related to the South African fungus, *Asterina gibbosa* differs very considerably in habit and in a number of details. The thyriothecia are widely scattered, and the hyphae appear to be more slender than stated by Theissen; they are ca. 4 μ thick.

The spores of *Asterina gibbosa* germinate in a similar fashion to that described above in *Asterolibertia megathyria*, but the primary hyphopodium is clavate or ovate, entire, not lobed. In the genus *Asterina* the spore usually produces one hyphopodium from each cell (usually at each pole) and hyphae develop directly from the spore in close proximity to these. The spore is persistent and can often be detected, unchanged in form, in the centre of large colonies. In the species of *Asterolibertia* examined, the spore is thin-walled and collapses; it disappears soon after germination.

The genus *Asterolibertia* was established by Arnaud for *Asterina*-like fungi with "node cells" or intercalary stigmocysts in place of typical hyphopodia. So far as can be judged from the South African material, these species are sufficiently distinct to warrant their separation into another genus.

1a. *Asterolibertia megathyria* Doidge var. *Randia* nov. var.

Colonies epiphyllous, rarely hypophyllous, small, up to 2.5 mm. diam. Hyphae 2-4 μ thick, with node cells which are distant and irregular and 5-8 μ diam.; cells 7.5-10 μ long in the neighbourhood of the thyriothecia and the nodes, elsewhere up to 20 μ long; branches numerous, irregular, often opposite.

Thyriothecia massed in the centre of the colony, as in the type, and similar in colour and structure, 75-100 μ diam. Asci ovate or subclavate, 4-spored, broadly rounded above, attenuate to a sessile base, 22-28 \times 12-15 μ . Spores parallel or conglobate, oblong, 15-18 μ long, upper cell subglobose, 5-7.5 μ long and 5-6.5 μ broad, lower cell subcylindrical, 9-11 μ long and 5 μ broad. On germination, spores give rise to a single 1-celled hyphopodium, which is more or less lobed, often palmately 3-lobed, 6-7.5 μ long and broad.

On *Randia dumetorum* Lam., on leaves, Durban, Medley Wood, 9029; Amanzimtoti, Doidge, 1682; Umgeni, Medley Wood, 9031; Lemana, Northern Transvaal, Doidge 1792, Type.

Canthium Gueinzii Sond., Hog's Back, Henderson, 11347.

Canthium capensis Sond., Hog's Back, Henderson, 11348.

2. *Asterolibertia Burchelliae* Doidge nov. comb.

Syn.: *Asterinella Burchelliae* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) pp. 267, 278.

Prillieuxina Burchelliae (Doidge) Ryan, Stevens and Ryan, The Microthyriaceae (1939) p. 77. [Plate LXI.]

Colonies epiphyllous, minute, black, ca. 1 mm. diam, more or less circular in outline, scattered.

Mycelium rather sparse, radiating. Hyphae dark olive buff to light brownish olive, undulating, 3-4 μ thick; cells mostly 10-13 μ long; branching irregular. Node cells alternating with cylindrical hyphal cells with fair regularity, only slightly broader, cylindrical to barrel-shaped, mostly 5-5.5 μ thick.

Thyriothecia grouped in the centre of the colony, more or less circular in outline, 90-120 μ diam., often flattened laterally by contact and becoming confluent in groups. Basal layer delicate, subhyaline, structure not evident. Covering membrane slightly convex, snuff brown, composed of straight, radiating hyphae 2.5-3 μ thick, central cells almost cubical, 3-4 μ long, cells nearer the margin up to 5 μ long; margin briefly and rather coarsely fimbriate, fringing hyphae light brownish olive, often subtorulose; breaking up at maturity into several triangular segments, through the formation of stellate fissures. Asci ellipsoid-ovate or broadly cylindrical, rounded above, sessile, with a firm wall slightly thickened round the apex, 27-37.5 \times 16-20 μ . Spores conglobate or subdistichous, oblong, rounded at both ends, 1-septate, slightly constricted, dark olive buff, thin-walled, smooth, 13-17.5 \times 5-6.5 μ ; upper cell somewhat shorter and broader than the lower. On germination the spore gives rise to a single, firm-walled hyphopodium, which is snuff brown, ovate or subglobose, 7.5-9 μ long and 5-7.5 μ broad; from the base of this a hypha develops, which early branches to form the mycelium.

On *Burchellia capensis* R. Br. Woodville Forest, George, *Doidge* 10940, Type; Keurkloof Forest, George, *Doidge*, 17121; Storm's River, *Doidge*, 17162; Deepwalls, Knysna, *Doidge*, 17202; Knysna, *van der Byl* 2495, 2285. *Tarenna pavettoides* Bth. & Hk., Umtentwini, *Wager* 184, 32674.

ASTERINELLA Theiss.

Ann. Myc. 10 (1912) p. 160; Broteria (1912) p. 101.

Syn.: *Prillieuxina* Arnaud, Ann. École Nat. Agr. Montp. 16 (1918) p. 161.

Superficial mycelium brown, septate, branched, without hyphopodia. Thyriothecia dimidiate, scutate, round, radial in structure, dehiscing from the apex. Asci globose to ovate or cylindrical-ellipsoid, with or without typical paraphyses. Spores 2-celled, brown.

KEY TO SOUTH AFRICAN SPECIES.

- | | | |
|---|------------------------------|--|
| A.—Spores smooth, 20-26.5 μ long. | | |
| (a) Thyriothecia 200-220 μ diam..... | 1. <i>A. Tecleae</i> . | |
| (b) Thyriothecia 120-180 μ diam..... | 2. <i>A. Pterocelastri</i> . | |
| B.—Spores minutely scaberulous, 28-33 μ long..... | 3. <i>A. Mimosopidis</i> . | |

1. *Asterinella Tecleae* Doidge nov. spec. [Plate LXII.]

Colonies hypophyllous, mostly along the leaf margins and veins, thin, greyish black, irregular in outline and poorly defined.

Mycelium delicate, ahyphopodiate, more or less closely reticulate. Hyphae deep to dark olive buff, more or less undulating, irregular in thickness, mostly 2-2.5 μ thick, occasionally up to 4 μ , sub-nodulose in places, septation obscure, branching freely and irregularly.

Thyriothecia few, interspersed with the pycnidia, from which they are hardly distinguishable, scattered or confluent in groups of 2-4, 200-220 μ diam. Basal layer delicate, structure not evident. Covering membrane slightly convex, avellaneous to buffy brown, pellucid, composed of radiating hyphae 2-3 μ thick, central cells 4-6 μ long, cells near margin slightly longer, up to 10 μ ; margin briefly fimbriate; splitting at maturity into triangular segments by a number of radiating stellate fissures. Asci fairly numerous, up to ca. 20 in each thyriothecium, 8-spored, subglobose to ovate, sessile, 22-37.5 \times 25 μ , with a firm wall ca. 1 μ thick, slightly thickened (2-5 μ) round the apex. Spores conglobate, at first hyaline, becoming buffy brown rather tardily, subclavate, 1-septate, not constricted or very slightly so, broadly rounded above, tapering to an acutely rounded or subtruncate base, 20-26.5 μ long; upper cell ovate, 11-14 μ long and 7.5-10 μ broad, lower more or less cuneate, 9-12.5 μ long and 6-8 μ broad near the septum.

Pycnidia numerous, closely resembling the thyriothecia. Conidia cylindrical or cylindrical-clavate, obtusely rounded to truncate at both ends, hyaline, straight or slightly curved, 7-septate, 45-50 \times 3.5-5 μ .

On *Teclea natalensis* Engl., on leaves, West Wood, Haenertsburg, *Doidge*, 17783.

2. *Asterinella Pterocelastri* Doidge.

Bothalia I (1924) p. 198.

Syn.: *Prillieuxina Pterocelastri* (Doidge) Ryan, Stevens and Ryan, *The Microthyriaceae* (1939) p. 80. [Plate LXIII.]

Colonies hypophyllous, thin, greyish black, circular to irregular in outline, 4–10 mm. diam., scattered or more or less crowded, becoming confluent and covering large areas of the leaf surface.

Mycelium more or less closely reticulate. Hyphae deep to dark olive buff, more or less undulating or tortuous, 2.5–4 μ thick, subtorulose in places, branching freely and irregularly and forming a very irregular network; septation obscure.

Thyriothecia fairly numerous, scattered or in small groups and becoming confluent, circular in outline, 120–180 μ diam. Basal layer delicate, hyaline, structure not evident. Covering membrane slightly convex, dark olive buff, pellucid, formed of rather sinuous, radiating hyphae 2.5–4 μ thick, central cells 3–5 μ long, margin cells longer; margin briefly fimbriate; dehiscing at maturity by irregularly radiating stellate fissures. Asci fairly numerous, mostly 8-spored, occasionally 4-spored, ovate or ovate-oblong, broadly rounded above, sessile, 30–37.5 \times 20–25 μ , with a firm wall, ca. 1 μ thick, slightly thickened (ca. 5 μ) round the apex. Spores conglobate or subdistichous, ellipsoid-oblong, rounded at both ends, broadly rounded or tapering slightly above, tapering gradually and more definitely downwards, 1-septate, slightly constricted, smooth, thin-walled, deep to dark olive buff, 20–25 μ long: upper cell usually shorter and broader, 10–11.25 μ long and 8–9 μ broad, lower 12.5–14 μ long and 7–7.5 μ broad at the septum.

On *Pterocelastri tricuspidatus* Sond. (= *Pt. variabilis* Sond.) on leaves, Storm's River, Doidge, 17190; Deepwalls, Knysna, Doidge 17222.

The spores are longer than stated in the original description; it is probable that those previously examined were not fully mature.

3. *Asterinella Mimusopsidis* Doidge.

Bothalia I (1922) p. 80.

Syn.: *Prillieuxina Mimusopsidis* (Doidge) Ryan, Stevens and Ryan, *The Microthyriaceae* (1939) p. 81. [Plate LXIV.]

Colonies hypophyllous, black, more or less circular in outline, up to 5 mm. diam., scattered, occasionally numerous and becoming confluent.

Mycelium radiating. Hyphae slightly undulating, often tortuous, especially in the neighbourhood of the thyriothecia, dark olive buff to isabella colour, irregular in thickness, mostly 2.5–5 μ thick, in places up to 7 μ ; cells uneven in length, often 25–35 μ long, but frequently shorter; branching irregular, branches usually at an acute angle with the hypha, becoming much interwoven and tangled; in places 2 or 3 hyphae run closely parallel for some distance, forming loose strands.

Thyriothecia very numerous, rarely scattered, usually closely crowded near the centre of the colony and becoming confluent in groups. Single thyriothecia more or less circular in outline, 350–500 μ diam. Basal layer delicate, hyaline, structure not evident. Covering membrane slightly convex, at first isabella colour to old gold, translucent, rapidly becoming darker in the centre, brownish olive and subopaque; finally it is blackish brown and opaque in the centre, with a broad, translucent margin about 75 μ broad; formed of sinuously radiating hyphae 2.5–4 μ thick, cells mostly 15–20 μ long; margin at first entire, undulating, becoming more or less fimbriate at maturity, fringing hyphae deep olive buff, 3–3.5 μ thick, more or less tortuous; splitting at maturity into a few broad segments, through the formation of stellate radiating cracks, the central part finally breaking wavy. Asci numerous, ovate or ovate-oblong, 8-spored, broadly rounded above, sessile, 60–75 \times 25–40 μ , with a firm wall. Paraphysoids sub-persistent, hyaline, filamentous, exceeding the asci, ca. 2–2.5 μ thick, slightly swollen at the tips. Spores distichous or conglobate, oblong, broadly rounded at both ends, 1-septate, constricted, buffy olive, at first smooth, very minutely scaberrulous at maturity, 28–33 μ long; upper cell slightly larger, 15–17.5 μ long and 14–16.5 μ broad, lower 14–16.5 μ long and 12–14 μ broad. Spores often found germinating in the ascus.

On *Mimusops obovata* Sond., on leaves, Pirie Forest, Kingwilliamstown, Doidge, 12267 East London, Doidge, 12409; Alexandria, Doidge, 22369.

LEMBOSIOPSIS Theiss.

Ann. Myc. 11 (1913) p. 435.

Thyriothecia linear, paraphyses present; spores hyaline, 2-celled, mycelium ahyphopodiate.

Lembosiopsis eucalyptina Petr. et Syd.

Ann. Myc. 22 (1924) pp. 372-374.

[Plates LXV, LXVI.]

Colonies on leaf spots, which are amphigenous, more or less scattered, not penetrating to the opposite side of the leaf, rather sharply defined, more or less circular in outline, 4-8 mm. diam., rarely up to 10 mm., often numerous and becoming confluent, thus forming larger irregular blotches, snuff brown to verona brown.

Mycelium not visible to the naked eye, reticulate; in the centre of the colony with rounded-angular meshes about 25-30 μ diam. Hyphae dark olive buff to isabella colour, undulating, rather obscurely septate, cells often 25-35 μ long, often fused by lateral walls into strands of 2 or more, apparently more or less following the outlines of the epidermal cells of the host, and entering the leaf through the stomata. On the older spots, the mycelium becomes denser near the edges, the hyphae running parallel (when closely crowded producing a palisade-like structure) more or less torulose, darker (snuff brown to warm sepia) and with more frequent septations, cells 10-13 μ long; a more or less definite margin to the colony is thus formed.

Thyriothecia scattered, usually in limited numbers near the centre of the colony, sometimes single, but frequently in groups of 3-4, which fuse at the ends and produce compound Y- or X-shaped ascogmata. Individual *thyriothecia* linear, straight or slightly curved, not tapering towards the broadly rounded ends or only slightly so 250-400 \times 75-100 μ . Basal layer quite flat, about 10-12 μ thick, composed of rather thick-walled cells 4-5.5 μ diam., the outer cells rather light pellucid olive green, the inner almost hyaline. Covering membrane rather brittle, almost opaque and blackish brown in the centre, composed of rounded-angular or slightly elongated cells ca. 4-5 μ diam.; near the margin the hyphae are pellucid, definitely radiating and are prolonged more or less freely into the mycelial hyphae. Asci 8-spored, broadly clavate or ovate, broadly rounded above, tapering rather suddenly to a sessile base, thick-walled, thickened round the apex (ca. 5 μ) 28-42 \times 12.5-15 μ . Spores distichous or imperfectly tristichous, oblong, broadly rounded at both ends, 1-septate, not constricted or slightly so, 9-12.5 \times 4-5 μ ; cells approximately equal in length, or the upper slightly shorter and broader than the lower, which tapers somewhat. Paraphyses rather numerous, filiform, stout, 1.5-2 μ thick, more or less branched at the apex; lateral branches thickened (up to 3 μ) tinged pale olive green, exceeding the asci and forming a typical epithecium.

Pycnidia (*Thyrinula eucalyptina* Petr. et Syd.) scattered, usually near the edge of the leaf spots, discrete, rarely fused in groups of 2 or 3, circular in outline, slightly convex, 80-130 μ diam., rarely up to 150 μ . Covering membrane brittle, carbonaceous, with a round, central pore ca. 5 μ diam., similar in structure to the membrane of the *thyriothecia*. Conidiophores closely crowded, small, conical, ca. 4.5 μ long, 1.5-2 μ thick at the base, sometimes up to 10 μ long, and then cylindrical with a bulbous base. Conidia hyaline, thin, rod-shaped or filiform, more or less curved, seldom quite straight, obtuse at the ends, 1-celled, 5-22 μ long, 0.75 μ thick.

On *Eucalyptus coriacea* A. Cunn., on leaves, Jessievale Plantation, Vosmansbeacon, District Forest Officer, 17285.

Eucalyptus gigantea Dehn., Jessievale, District Forest Officer, 17096, 17266 Type, 20458; Insizwa, E. Griqualand, District Forest Officer, 20453; Ingeli, Pietermaritzburg District, District Forest Officer, 20455; Kubusi, Stutterheim, District Forest Officer, 20456, 20457; Evelyn Valley, Kingwilliamstown, District Forest Officer, 20619.

Eucalyptus globulus Lab., Woodbush, Doidge, 17753.

Eucalyptus hemiphloia F. v. M., Jessievale, District Forest Officer, 17287.

Eucalyptus obliqua L'Her., Jessievale, District Forest Officer, 17286.

Eucalyptus regnens F. v. M., Jessievale, District Forest Officer, 17265.

Eucalyptus sp., Rosetta, Natal, Sim, 12494.

The connection between the mycelium producing the pycnidial and the ascus stage seems fairly clear, but Petrak and Sydow (loc. cit.) have described the conidial stage as the type of a new genus, *Thyrinula*. "In Gesellschaft dieses Pilzes (i.e. *Lembosiopsis*

eucalyptina) wächst in dieselben Flecken eine Nebenfrucht-form, die sicher dazu gehört". Two collections were studied by Petrak and Sydow, No. 17266 on *Eucalyptus gigantea* and No. 17753 on *Eu. globulus*, the former evidently being taken for the type.

Sections of leaves from these two collections have been examined. In leaves of *Eu. gigantea*, the hyphae of the fungus penetrate into the stomatal cavity, and for a short distance between the cells of the mesophyll. (Plate LXVII, a, b.). In the leaves of *Eu. globulus*, there is a more extensive internal mycelium. The hyphae push between the guard cells, proliferate in the substomatal cavity, and often push between the cuticle and the epidermis, forming small patches of subcuticular hypostroma. Separate hyphae grow between the cells of the mesophyll and penetrate as far as the epidermis on the opposite side of the leaf.

The thyriothecia are quite superficial, but the pyrenidia may arise from the superficial hyphae or from the subcuticular hypostroma; in the latter case they are at first covered by the cuticle, which ruptures as they develop; they are finally superficial.

The parasitism of this fungus and the relation between the ascus and the conidial forms need further study.

LEMBOSIA Lév.

Ann. Sc. Nat. Sér. 3. Bd. III (1845) p. 58.

Syn.: *Morenoella* Speg. Fung. Guaran. I (1883) p. 258.

Superficial mycelium usually well developed, with hyphopodia. Thyriothecia linear, otherwise like *Asterina*. Covering membrane developing a longitudinal fissure at maturity. Hypothecium flat, filamentous. Basal membrane thin or wanting. Asci ovate to clavate, thick-walled, with or without typical paraphyses. Spores 2-celled, brown.

KEY TO SOUTH AFRICAN SPECIES.

A.—Hyphopodia fairly numerous, usually alternate, cylindrical to pyriform..... 1. *L. Phillipsii*.

B.—Hyphopodia few, distant.

(a) Hyphae less than 4μ thick.

1. Spores $17-20\mu$ long 2. *L. piriensis*.

2. Spores $15-17\mu$ long 3. *L. Wageri*.

(b) Hyphae $4-6\mu$ thick..... 4. *L. durbanensis*.

1. *Lembosia Phillipsii* Doidge nov. comb.

Syn.: *Morenoella Phillipsii* Doidge, Bothalia I (1924) p. 205. [Plate LXVII.]

Colonies hypophyllous or caulicolous; on the leaves thin, greyish black, scattered, poorly defined, at first more or less circular and up to 1 cm. diam., often very numerous, becoming confluent and covering large areas of the leaf surface, especially near the margins and base of the leaf; often densely clothing the stems and petioles of young seedlings.

Mycelium on the leaves loosely reticulate, forming a network with angular meshes; denser and more closely interwoven on the stems and petioles. Hyphae undulating slightly, buffy brown, $3-4\mu$ thick, rather obscurely septate, cells mostly $20-25\mu$ long, branching irregular. Hyphopodia fairly numerous, alternate or unilateral, rarely opposite, 1-celled, mostly erect and at right angles to the hypha or nearly so, cylindrical to truncate-conical or subpyriform, rounded or subacute, at the apex, straight or somewhat curved, $6-15\mu$ long, mostly $7-9\mu$ long, $3.5-5\mu$ broad at the base; in places complete or incomplete circles are formed by the proximity of two hyphopodia on a curved hypha, or by the fusion of a branchlet with a hyphopodium.

Thyriothecia scattered, numerous, discrete, or crowded and becoming confluent in irregular groups; at first circular, rapidly becoming elliptic or linear in outline, but occasionally remaining almost circular, $240-600\mu$ long, $90-160\mu$ broad. Covering membrane snuff brown to cinnamon brown, becoming subopaque in the centre, formed of radiating hyphae $3-5\mu$ thick, cells mostly $5-6\mu$ long; dehiscing at maturity by a longitudinal slit, which later becomes widely distended, exposing the asci; margin raggedly fimbriate. Asci fairly numerous, 8-spored, ovate, sessile or with a short, peg-like foot, $26-33.5 \times 18-20\mu$, with a firm wall, slightly thickened round the apex. Spores tristichous or conglabate, snuff brown, oblong, rounded at both ends, 1-septate, deeply constricted, $14-16.5\mu$ long; cells subequal, or the upper rather shorter and broader than the lower, separating readily at the septum, upper cell 7.5μ long and $5.5-6.3\mu$ broad, lower $7.5-9\mu$ long and $5-5.5\mu$ broad.

On *Ocotea bullata* E. Mey., on leaves, Montagu Pass, near George, Doidge, 17127; Deepwalls, Knysna, Doidge, 17205 Type; Deepwalls, J. Phillips (van der Byl 2257); Knysna, van der Byl 2279.

2. *Lembosia piriensis* Doidge.

Bothalia I (1922) p. 78.

[Plate LXVIII.]

Colonies epiphyllous, scattered, thin, greyish black, more or less circular, up to 1 cm. diam., sometimes numerous and covering almost the whole of the leaf surface.

Mycelium reticulate, forming a network with angular meshes. Hyphae dark olive buff to isabella colour, slender, straight or somewhat sinuous, $3\text{--}3.5\ \mu$ thick, obscurely septate; branching irregular and often more or less fasciculate in the neighbourhood of the hyphopodia. Hyphopodia not numerous, distant, unilateral or alternate, 1-celled, subglobose or pulvinate, rarely sublobed, often broader than long, $4\text{--}6\ \mu$ long and $6\text{--}9\ \mu$ broad.

Thyriothecia scattered, elliptic in outline, straight, simple or occasionally forked, $200\text{--}350\ \mu$ long, $120\text{--}170\ \mu$ broad. Covering membrane snuff brown near the margin, early becoming darker in the centre and opaque or subopaque, slightly convex; near the margin, distinctly radiating in structure and formed of hyphae $3\text{--}4\ \mu$ thick, cells mostly $8\text{--}10\ \mu$ long; copiously and rather briefly fimbriate at the margin; at first closed, then dehiscing by a longitudinal crack. Asci fairly numerous, 6–8-spored, ovate, sessile, $37\text{--}42.5 \times 20\text{--}25\ \mu$, with a firm wall slightly thickened round the apex. Spores conglobate, snuff brown, oblong, rounded at both ends, 1-septate, constricted, smooth, $17\text{--}20 \times 6\text{--}7.5\ \mu$; upper loculus slightly broader. Paraphysoids more or less persistent, fairly numerous, filamentous, subhyaline, about $2\ \mu$ thick.

Pycnidia not very numerous, scattered, hemispherical, $60\text{--}100\ \mu$ diam.; covering membrane convex, with a central pore, formed of radiating hyphae $2.5\text{--}3\ \mu$ thick. Conidia hyaline, bacillary, up to $5\ \mu$ long and ca. $0.5\ \mu$ broad.

Mycelial conidia scattered, borne laterally on the hyphae, on short, conical, straight or curved, 1-celled conidiophores, or at the tips of short lateral branches, cylindrical or subclavate, snuff brown, 6–12-septate, truncate at the base, rounded or subacute at the apex, very slightly constricted at the septa, occasionally more deeply constricted, especially near the apex, often uneven in width, $50\text{--}100\ \mu$ long and $6\text{--}9\ \mu$ broad.

On *Trichocladus ellipticus* E. & Z., on leaves, Pirie Forest, Kingwilliamstown, Doidge, 12301, Type; Alexandria, Doidge, 22426.

This fungus is very similar in general habit to *Asterina secamonicola*, *A. dissiliens* and *A. inconspicua*, the fasciculate branching near the hyphopodia being particularly characteristic. In some respects these four fungi and *Lembosia durbana* resemble the superficial growth of *Asterodothis solaris*, but no internal mycelium could be detected in the leaf sections examined. The mycelial conidia of *Lembosia piriensis* are similar in type to those of *Asterodothis solaris*, but are longer and have more septations; conidia are more numerous in No. 22406 than in the type collection.

Lembosia piriensis is found associated with *Isipinga contorta* and *Irene scabra*, on the same leaves.

3. *Lembosia Wageri* Doidge nov. spec.

[Plate LXIX.]

Colonies epiphyllous, black, irregular in outline, poorly defined and up to about 3 mm. diam.; at first scattered, but usually very numerous, becoming confluent and covering the whole surface of the leaflet, or at least its lower half.

Mycelium radiating irregularly. Hyphae light greyish olive or greyish olive to buffy brown, $2.5\text{--}4\ \mu$ thick, more or less undulating, occasionally running parallel to one another and forming strands of 2 or 3 hyphae, becoming more or less closely interwoven; branching irregular; septations obscure and rather distant. Hyphopodia few, distant, scattered, continuous or 2-celled, very irregular in form, usually more or less lobed, mostly $6\text{--}10\ \mu$ long and $5\text{--}8\ \mu$ broad, sometimes broader than long.

Thyriothecia very numerous, crowded together in large groups, often becoming confluent or completely fused, forming large, irregular, compound ascomata; single thyriothecia linear-oblong, straight, curved or forked, $200\text{--}300\ \mu$ long and $80\text{--}120\ \mu$ broad, dehiscing by an irregular longitudinal crack running almost the whole length of the covering membrane, or more or less circular in outline, $120\text{--}150\ \mu$ diam., with stellate dehiscence. Basal layer delicate, hyaline, structure not evident. Covering membrane slightly convex, pellucid, buffy brown to warm sepia, becoming subopaque in the centre, formed of radiating hyphae $2\text{--}3\ \mu$ thick, cells $4\text{--}6\ \mu$ long, marginal cells longer; margin more or less fimbriate, fringing hyphae paler, tortuous, $1.5\text{--}2\ \mu$ thick. Asci very numerous, ovate to subglobose, broadly rounded above, sessile, 6–8-spored, $23\text{--}30 \times 16\text{--}20\ \mu$, with a firm wall ca. $1\ \mu$ thick. Paraphysoids not seen. Spores conglobate, becoming almost parallel, clavate-oblong, broadly rounded above, tapering more or less to a rounded base, 1-septate, not constricted

or very slightly so, smooth, greyish olive, 15–17 μ long; upper cell subglobose, 6–25 μ long and 5–6–25 μ broad, lower cuneate-oblong, 8–75–11 μ long and ca. 5 μ broad at the septum.

On *Teclea natalensis* Engl., on leaves, Umhlanga Rocks, Natal, Wager, 32472.

It is very difficult to free mature spores from the ascus; they become parallel and germinate in the ascus, a germ tube being formed consistently at the lower end. From this fact and from an examination of young colonies, it seems likely that the spores are not released from the ascus, but that the germ tubes grow out through it.

4. *Lembosia durbana* van der Byl.

South Afr. Jour. Sci. 26 (1929) p. 319.

[Plate LXX.]

Colonies epiphyllous, scattered, thin, greyish black, more or less circular in outline, up to 3 mm. diam.

Mycelium radiating, becoming loosely reticulate. Hyphae buffy brown to olive brown, main hyphae mostly 4–6 μ thick, in places up to 8 μ , often running closely parallel, becoming fused laterally and forming strands of 2–4 elements; hyphae usually almost straight, in places more or less undulating, rather obscurely septate, cells often 18–25 μ long; branching irregular, secondary hyphae paler, deep to dark olive buff, 2–5–4 μ thick. Hyphopodia not numerous, unilateral or alternate, often rather darker brown than the hyphae, hemispherical to pulvinate, 3–5–5 μ long, 6–9 μ broad.

Thyriothecia not very numerous, scattered or in small groups near the centre of the colony, oblong to linear, not tapering to the broadly rounded ends, straight, curved or forked and becoming triangular, 300–500 μ long, 140–200 μ broad. Basal layer hyaline or subhyaline, ca. 2–5–4 μ thick. Covering membrane slightly convex, at first buffy brown, becoming blackish brown and opaque in the centre, formed of radiating hyphae 2–5–4 μ thick, more or less fimbriate at the margin; fringing hyphae pellucid, olive buff to buffy brown, almost straight; dehiscing at maturity by an irregular longitudinal fissure, running almost the whole length of the covering membrane. Asci fairly numerous, oblong-clavate, broadly rounded above, tapering somewhat to the sessile or subsessile base, 8-spored, 50–60 \times 12–5–17–5 μ , with a firm wall, thickened round the apex (5–10 μ). Spores more or less distichous, ellipsoid-oblong, rounded at both ends, 1-septate, rather deeply constricted, buffy brown, smooth, 17–20 μ long; cells subequal, or the upper somewhat shorter and broader, 7–5–9 μ long and 6–8 μ broad, lower 8–10 μ long and 5–5–7 μ broad. Paraphysoids fibrose, hyaline or subhyaline, subsistent, 1–5–2–5 μ thick.

Pycnidia fairly numerous, scattered, circular in outline, 50–75 μ diam.; covering membrane convex, blackish brown, opaque except at the margin, where it is more or less translucent, olive brown, formed of straight radiating hyphae, 2–5–3 μ thick; dehiscing by a rather indefinite central pore. Conidia not seen.

On *Cassine laurifolia* (Harv.) Davison, Durban, Forbes (van der Byl 2526).

The host of this fungus is not *Chaetacme aristata* as stated in the original description; it is certainly a Cassine and probably *Cassine laurifolia*. Unfortunately the type collection consists of only a few detached leaves, and a more certain identification of the host is not possible.

ECHIDNODES Theiss. et Syd.

Ann. Myc. 15 (1917) p. 422.

Syn.: *Echidnodella* Th. et Syd., Ann. Myc. 15 (1917) p. 422.

Like *Lembosia*, but mycelium without hyphopodia.

KEY TO SOUTH AFRICAN SPECIES.

- | | |
|---|-------------------------------|
| A.—Parasitic on fungus mycelium..... | 1. <i>Ech. lembosioides</i> |
| B.—Leaf parasites. | |
| (a) Spores 14–17–5 μ long. | |
| 1. Spores 6–6–5 μ broad..... | 2. <i>Ech. Acokantherae</i> . |
| 2. Spores 7–9 μ broad..... | 3. <i>Ech. Rhoina</i> . |
| (b) Spores 17–5–25 \times 6–7–5 μ | 4. <i>Ech. natalensis</i> . |
| (c) Spores 12–15 \times 5–6–5 μ | 5. <i>Ech. africana</i> . |
| (d) Spores 10–14 \times 4–5 μ | 6. <i>Ech. Hypolepidis</i> . |

1. *Echidnodes lembosioides* Doidge nov. comb.

Syn.: *Asterinella lembosioides* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) pp. 267, 279.

Plate LXXI.

Mycelium pale, more or less densely reticulate and interwoven, and closely investing the hyphae of *Balladyna velutina* and *Meliola littoralis*. Hyphae deep to dark olive buff, 2–4 μ thick, undulating or tortuous, obscurely septate, branching freely and irregularly.

Thyriothecia fairly numerous, scattered or more or less confluent in small groups, very variable in form, circular in outline, 200–240 μ diam., broadly elliptic, 280–330 \times 160–220 μ or linear, 350–800 \times 120–180 μ , linear thyriothecia straight, bent or forked; all three forms often occur in the same colony. Basal layer delicate, structure not evident. Covering membrane slightly convex, dark olive buff to buffy brown, becoming blackish brown and opaque in the centre, formed of radiating hyphae 2–4 μ thick; margin not fimbriate or briefly and sparsely so; dehiscing at maturity by irregular central fissures, which in the linear thyriothecia are longitudinal, running almost the whole length of the covering membrane. Asci numerous, oblong-clavate, 8-spored, broadly rounded above, tapering more or less to a sessile base, 35–45 \times 17–20 μ , with a firm wall, slightly thickened round the apex. Spores subdistichous or conglobate, oblong, broadly rounded at both ends, 1-septate, slightly constricted, smooth, dark olive buff to buffy brown, 13.5–15 μ long; cells subequal or the upper slightly larger, upper cell 6–7.5 μ long and broad, lower 6.5–7.5 μ long and 5–6.5 μ broad. Paraphyses numerous, persistent, filiform, hyaline, ca. 1 μ thick, somewhat swollen and clavate at the tips.

Pycnidia similar to the round thyriothecia but smaller, 120–180 μ diam. Conidia numerous, hyaline, continuous, fusoid, curved, lunate or sinuous, tapering to both ends, 15–20 μ long, 1.5–2 μ broad in the centre.

On mycelium of *Balladyna velutina* (B. & C.) v. Höhn., and *Meliola littoralis* Syd., on leaves of *Canthium Guerinii* Engl., Buceleuch, near Cramond, Doidge, 11574.

2. *Echidnodes Acokantherae* Doidge nov. comb.

Syn.: *Asterinella Acokantherae* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) pp. 266, 278.

Prillieuria Acokantherae (Doidge) Ryan, Stevens and Ryan, The Microthyriaceae, (1939) p. 77. [Plate LXXII.]

Colonies hypophyllous, scattered or crowded, especially numerous near the leaf margins, thin, greyish black, more or less circular in outline and up to 5 mm. diam.; often numerous, becoming confluent, and covering a great part of the leaf surface.

Mycelium delicate, loosely reticulate. Hyphae dark olive buff or ecru olive, more or less undulating, 2.5–4 μ thick, obscurely septate, branching irregular.

Thyriothecia not numerous, scattered, or more frequently in close association with the pycnidia, elliptic to narrow-oblong in outline, straight or curved, occasionally forked, rarely almost circular in outline, 160–250 μ long, 75–100 μ broad. Basal membrane delicate, subhyaline, radiating in structure. Covering membrane slightly convex, dark olive buff to Dresden brown, at first pellucid, becoming subopaque in the centre, formed of radiating hyphae 2.5–3 μ thick, closely septate, cells almost cubical, 3–5 μ long, margin fimbriate, dehiscing by a longitudinal slit almost the length of the thyriothecium. Asci numerous, ovate to oblong, broadly rounded above, tapering downwards or narrowed suddenly to a sessile base, 8-spored, 26–35 \times 13–17 μ , with a firm wall, slightened (ca. 5 μ) round the apex. Spores subdistichous or conglobate, oblong, rounded at both ends, 1-septate, very slightly constricted, dark olive buff, smooth, thin-walled, 13–17.5 μ long; upper cell 6–7.5 μ long and 6–6.5 μ broad, lower 7–10 μ long, ca. 5 μ broad at the septum and tapering somewhat downwards.

Pycnidia extremely numerous, circular in outline, often becoming confluent and somewhat irregular, 90–120 μ diam.; structure of covering membrane similar to that of the thyriothecia, but somewhat paler, dehiscence stellate. Conidia hyaline, cylindrical to fusiform, 3-septate, base truncate, apex bluntly conical, straight or slightly curved or bent, 20–24 \times 3–3.5 μ .

On *Acokanthera spectabilis* Hk. f., on leaves, Medley Wood 6450, 333, 9510 and Medley Wood 6461, 341, 9521; Tongaat, van der Byl, 6951, Type; Bonza Bay, East London, Bottomley, 26683; Ebb and Flow, Wilderness, Doidge, 17112.

Acokanthera venenata G. Don., East London, Doidge, 10915, 12393; Alexandria, Doidge, 22348; Bracken Hill, Knysna, van der Byl 2315.

Carissa bispinosa (L.) Desf. (= *Carissa arduina* Lam.) Assegai Bush, Humansdorp Distr., Doidge, 17238; Louis Trichardt, V. A. Putterill, 11849.

Medley Wood 6450 is quoted by P. Sydow in *Fungi natalensis* [Hedwigia 38, 1899, p. (132)] and by Medley Wood in the Report of the Natal Bot. Gdns. (1898) p. 11 under the name *Dimerosporium Acokantherae* P. Henn.; this fungus has an intramatrical hypostroma and was transferred by Theissen and Sydow to the genus *Hysterostoma* (Ann. Myc. 13,

1915, p. 238). It is not to be found on the portion of Medley Wood's collection 6450 in the cryptogamic herbarium at Pretoria, the only fungus on the leaves being the superficial form described as *Echidnodes Acokantherae*.

In *Ech. Acokantherae* thyriothecia are comparatively rare, sometimes absent, but pycnidia are present in great numbers; the latter were evidently confused with the thyriothecia in the earlier description (Doidge loc. cit.); the best ascus material was found in Medley Wood's collection 6461.

3. *Echidnodes rhoina* Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 269, 280.

[Plate LXXIII.]

Colonies amphigenous, but mostly epiphyllous, scattered, thin, greyish black, becoming more conspicuous and denser black with the formation of numerous thyriothecia, more or less circular, sometimes minute, 1-1.5 mm. diam., or up to 3 mm.; often numerous and, becoming confluent.

Mycelium pale, reticulate. Hyphae more or less undulating, usually only slightly so; main hyphae dark olive buff to buffy brown, 2.5-3.5 μ thick, rarely up to 5 μ , radiating, and with a tendency to run parallel to one another and fuse in strands of 2 to 3 units, obscurely septate, cells mostly 15-20 μ long, branching irregular; branches usually paler, deep to dark olive buff, and thinner, 2-2.5 μ thick, forming an irregular, rather tangled network between the main hyphae.

Thyriothecia not very numerous, scattered, occasionally confluent in small groups, elliptic-oblong in outline, straight, curved or occasionally forked, 150-400 μ long, 90-150 μ broad, sometimes almost circular. Covering membrane buffy brown, becoming darker and subopaque in the centre, composed of sinuously radiating hyphae 3-3.5 μ thick; margin more or less fimbriate; dehiscing by a longitudinal slit, almost the length of the thyriothecium. Asci very numerous, 8-spored, elliptic to ovate, sessile or with a short, peg-like foot, 40-52 \times 19-25 μ , with a firm wall, slightly thickened round the apex. Spores distichous or conglabate, dark olive buff, oblong, rounded at both ends, 1-septate, slightly constricted, 14-17.5 μ long; upper cell almost globose, 7-9 μ broad, lower slightly narrower, 6-7.5 μ broad; minutely and rather remotely verruculose-echinulate at maturity.

On *Rhus lucida* E. Mey., on leaves, van Staden's Pass, Doidge, 10887, Type, and Doidge 17263; Howieson's Poort, near Grahamstown, Doidge, 10957; Assegai Bush, Humansdorp District, Doidge, 17244; Hamilton Reservoir, Grahamstown, Britten, 14212.

Rhus mucronata Thunb., Knoetze, Knysna, van der Byl 2300.

Rhus Schlechteri Deels, Humewood, Port Elizabeth, Doidge, 2295.

On re-examination, the thyriothecia appear to be shorter than stated in the original description, and the asci and spores somewhat larger.

4. *Echidnodes natalensis* Doidge nov. comb.

Syn.: *Lembosia natalensis* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) pp. 268, 279, Pl. XIX, fig. 44. [Plate LXXIV.]

Colonies hypophyllous, thin, greyish black, scattered, poorly defined but more or less circular in outline, up to ca. 5 mm. diam.; often becoming confluent and covering the greater part of the leaf surface.

Mycelium loosely reticulate, forming a network with angular meshes. Hyphae dark olive buff, straight or somewhat sinuous, 3-3.5 μ thick, rather obscurely septate, branching irregular. No true hyphopodia; the cylindrical bodies described as hyphopodia (Doidge loc. cit.) appear to be undeveloped branches.

Thyriothecia scattered, elliptic to linear, occasionally forked, usually discrete, rarely becoming confluent, 280-450 μ long, 140-170 μ broad. Covering membrane buffy brown to snuff brown, more or less translucent, formed of radiating hyphae 2.5-3.5 μ thick, with cells 8-10 μ long; not fimbriate at the margin, or very briefly and sparsely so; dehiscing at maturity by an irregular longitudinal crack. Asci fairly numerous, 6-8-spored, subglobose or ovate, broadly rounded above, sessile 30-38 \times 20-27 μ , with a firm wall, slightly thickened round the apex. Spores conglabate, oblong, rounded at both ends, 1-septate, slightly constricted, buffy brown, smooth, 17.5-25 \times 6-7.5 μ ; upper cell slightly broader and sometimes shorter than the lower. Paraphysoids fairly persistent, hyaline, fibrose.

Pycnidia rather numerous, circular in outline, 200–250 μ diam.; covering membrane pellucid, dark olive buff, composed of radiating hyphae ca. 2 μ thick, dehiscence stellate. Conidia hyaline, fusoid with truncate base, 18–20 \times 3.5–5 μ .

On *Eugenia zuluensis* Dümmer, on leaves, Krantzklouf, Natal, Doidge, 8984; associated with *Asterina natalitia*.

The photograph reproduced in a previous paper (Doidge loc. cit.) gives a good idea of the habit of this fungus, but the picture is somewhat obscured by the presence of a parasite with dark conidia.

5. *Echidnodes africana* Doidge nov. comb.

Syn.: *Morenoina africana* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) pp. 242, 281.

[Plate LXXV.]

Colonies amphigenous and on the racis, minute, barely visible to the naked eye, scattered, occasionally crowded and becoming more or less confluent.

Mycelium sparse, radiating irregularly. Hyphae 2–2.5 μ thick, deep to dark olive buff, more or less undulating, obscurely septate, branching irregular.

Thyriothecia scattered or confluent in small groups, elliptic to linear, straight, curved or bent, occasionally forked, 120–200 μ long, 65–100 μ broad; sometimes becoming fused at the ends and forming L, Y.T. or K-shaped, compound ascomata, less frequently parallel and fused laterally. Covering membrane pellucid, dark olive buff to buffy brown, becoming darker and subopaque near the centre, slightly convex, formed of radiating hyphae 2–3 μ thick, cells almost cubical, 2–3.5 μ long; margin irregular but not fimbriate, a few of the hyphae forming the covering membrane run out into the mycelium; dehiscing by a longitudinal slit, almost the length of the thyriothecium. Asci very numerous (immature) oblong or ellipsoid-clavate, 23–27 \times 10–12 μ . Mature spores only seen outside the ascus, o long, rounded at both ends, 1-septate, scarcely constricted, buffy brown, smooth, 12–15 \times 5–6.5 μ ; cells equal or the upper slightly broader.

Pycnidia in small groups of 2–5, often in close contact with the thyriothecia, circular in outline, 60–100 μ diam., or becoming confluent, more or less flattened laterally and irregular in shape. Covering membrane dark olive buff, radiating, similar in structure to that of the thyriothecia, margin not fimbriate, dehiscence stellate. Conidia hyaline, ellipsoid, 3–5 \times 1.5–2 μ .

On *Dryopteris inaequalis* (Schl.) O. Kze., on pinnules and rachis, Zwartkop, near Maritzburg, Natal, Doidge, 11605.

A more careful study of this fungus reveals the presence of a delicate mycelium, which is persistent and radiating from the thyriothecia; it is therefore more suitably placed in the genus *Echidnodes*.

6. *Echidnodes Hypolepidis* Doidge nov. comb.

Syn.: *Echidnodella Hypolepidis* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) pp. 270, 281.

[Plate LXXVI.]

Colonies mostly epiphyllous, small, irregular in outline, scattered or confluent, usually along the midrib of the pinnules.

Mycelium ahyphopodiate, poorly developed, radiating irregularly or loosely reticulate. Hyphae slender, deep to dark olive buff, more or less deeply undulating, 2–3 μ thick; branching irregular, septation obscure.

Thyriothecia oblong, straight or curved, often forked, 120–240 \times 50–100 μ , rarely single, usually confluent in irregular groups in the centre of the colony, often completely fused and forming large, irregular, compound ascomata. Basal membrane delicate, structure not evident. Covering membrane slightly convex, buffy brown, pellucid, composed of radiating hyphae 2.5–3.5 μ thick, central cells almost cubical, marginal cells longer, up to 15 μ long; margin irregular but not fimbriate; dehiscing by a longitudinal slit nearly the length of the thyriothecium. Asci (immature) 8-spored, ovate, broadly rounded above, sessile, 20–25 \times 7–10 μ . Spores conglobate, buffy brown, oblong, rounded at both ends, 1-septate, slightly constricted, 10–14 \times 4–5 μ ; upper cell slightly broader and more broadly rounded.

Pycnidia round, 75–100 μ diam., with covering membrane similar in structure to that of the thyriothecia. Conidia ovate, ellipsoid or oblong, olive buff, 10–13 \times 5 μ .

On pinnules of *Hypolepis sparsisora* (Schr.) Kuhn, Woodville Forest, George, Doidge, 10930.

SPECIES EXCLUDENDAE.

Amazonia asterinoides (Wint.) Theiss.

Ann. Myc. 11 (1913) p. 499 ; Doidge and Sydow, Bothalia 2 (1928) p. 427.

Syn. : *Meliolaster Mackenzii* Doidge, Trans. Roy. Soc. S. Afr. 8 (1920) p. 123.

On *Piper capensis* L.f., on leaves, Buccleuch, near Cramond, Doidge, 11570.

The original description (Theissen loc. cit.) places the genus *Amazonia* in the Microthyriaceae, because the perithecium is inverse and radial in structure. v. Höhnelt (18) has shown that in this genus, under the shield-like cover, a completely closed perithecium exists, and regards this as a transition genus between *Meliola* and the Microthyriaceae.

In the Synoptische Tafeln of Theissen and Sydow (43), *Amazonia* is included in the Microthyriaceae, but Petrak (25, p. 123) points out that it is not nearly related to the genera which are placed on either side of it in the key. Theissen and Sydow themselves state (loc. cit.) that the genus is obviously similar to *Meliola* in the form of hyphae, hyphopodia and spores. Petrak points out that the resemblance is not confined to such external and purely unessential characters, but the history of development is similar and the resemblance is phylogenetic; the two genera cannot be placed in different families in a system of classification.

Amazonia asterinoides was included by Doidge and Sydow (11) in the Meliolineae.

Asterella Rehmii P. Henn.

Engl. Bot. Jahrb. 17 (1893) p. 114 ; Hopkins, Trans. Rhod. Sc. Ass. 35 (1938) p. 103.

On *Aloe* spp.

This is *Placoasterella Rehmii* (P. Henn.) Th. et Syd. in Ann. Myc. 13 (1915) p. 237 ; Doidge in Bothalia I (1921) p. 12.

As *Parasterella* nov. gen. in Herb. van der Byl No. 1667.

Asterina capensis Kalch. et Cke.

Grevillea IX (1880) p. 32.

On leaves of *Hippobromus alata* E. & Z., Grahamstown, MacOwan 1328.

This is *Meliola capensis* (K. et Cke.) Theiss., Ann. Myc. 10 (1912) p. 19. See also Doidge in Trans. Roy. Soc. S. Afr. 8 (1917) p. 731 and Bothalia I (1924) p. 71 ; also Doidge and Sydow in Bothalia 2 (1928) p. 442.

Asterina confluens Kalch. et Cke.

Grevillea IX (1880) p. 33, Pl. 137, fig. 45.

On *Plectronia ciliata*, MacOwan 1331.

According to van Höhnelt (17), this is the conidial stage of an indeterminable fungus. The fragment of the type in the Pretoria Herbarium is quite sterile and so also is a more recent collection. The host is now known as *Canthium ciliatum*.

Asterina ditricha Kalch. et Cke.

Grevillea IX (1880) p. 32.

On leaves of *Celastrus* sp., Inanda, Natal, May 1876, Medley Wood 3.

This is *Irene ditricha* (K. & Cke.) Doidge in S. Afr. Jour. Nat. Hist. 2 (1920) p. 41 Doidge and Sydow in Bothalia 2 (1928) p. 433.

As *Meliola ditricha* (K. & Cke.) Doidge in Trans. Roy. Soc. S. Afr. 5 (1917) p. 728 and 8 (1920) p. 138.

As *Irenina ditricha* (Doidge) Stevens in Ann. Myc. 25 (1927) p. 467.

Asterina infuscans Wint.

Hedwigia 24 (1885) p. 24 ; Theissen, Die Gattung Asterina (1913) p. 28.

As *Asterella infuscans* (Wint.) Sacc. in Syll. Fung. IX (1891) p. 394.

Theissen (loc. cit.) states that the ascomata of this fungus are not formed inversely beneath a hypha as in the Microthyriaceae but through a coil-like thickening of the ahyphopodiate hyphae ; the wall of the ascoma is parenchymatous, formed of almost spherical cells.

Winter's description is as follows : " Mycelium e hyphis ramosissimis, torulosis flexuosisque, septatis, fuscis, densissime intertextis constans, foliorum paginam inferiorem longe lateque obducens et infuscans. Perithecia gregaria sparsaque, minutissima, depresso

hemisphaerica, centro diffracta et demum evanescentia, fusco-atra, ambitu fibrillosa, 95–130 μ lata. Asci oblongi seu e basi parum ventricosa, sursum elliptici, fere sessiles vel in stipitem brevem attenuati, 8-spori, 30–35 μ longi, 9–11 μ crassi. Sporae conglobatae, clavatae, 2-cellulares, medio non constrictae, hyalinae, 8–9.5 μ longae, 2.5–3 μ crassae.

Ad folia subviva *Eucleae undulatae* Thunb. ad latera montis Boschberg prope Somerset East, Prom. bonae spei, leg. MacOwan."

This fungus is missing from MacOwan's collections in the National Herbarium, Pretoria; the original material is apparently immature, and Theissen was unable to find asci or spores. Its systematic position must remain doubtful until a study can be made of further collections in a more mature condition.

***Asterina interrupta* Wint.**

Flora (1884) p. 264.

On *Leucadendron* sp., on leaves, Muizenberg, MacOwan (Rabh. Fung. Eur. 3952).

Leucospermum conocarpum, Hottentots Holland, MacOwan (Rabh. Fung. Eur. 3951).

This is *Entopeltis interrupta* (Wint.) v. Höhn., Fragm. z. Myk. 10 (1910) No. 489.

Figured by Doidge in Bothalia 2 (1927) p. 233.

***Asterina MacOwaniana* Kalch. et Cke.**

Grevillea VII (1878) p. 57 and IX (1880) p. 33.

On *Gymnosporia buxifolia*, Boschberg, MacOwan 1250 (de Thüm. Myc. Univ. 568).

This is *Parenclerula MacOwaniana* (Thüm.) v. Höhn., Fragm. z. Myk. 10 (1910) No. 525. See also Doidge in Bothalia 1 (1924) p. 212 and Petrak in Ann. Myc. 26 (1928) p. 404. This fungus was figured by Arnaud (3, Plate 38) under the name *Englerulaster MacOwanianus* (Thüm.) Arn.

***Asterina myriadea* Cke.**

Grevillea X (1882) p. 130.

On leaves, Inanda, Medley Wood.

This is *Dimerium myriadeum* (Cke.) Theiss. in Ann. Myc. 10 (1912) p. 193; as *Dimerosporium*, Cooke in Grevillea XL (1882) p. 37.

***Asterina phaeostroma* Cke.**

Grevillea X (1882) p. 130.

On *Pavetta natalensis* on leaves, Inanda, Medley Wood 656, Herb. Kew. *Kraussia lanceolata*, Inanda, Medley Wood 652.

This is *Balladyna velutina* (B. & C.) v. Höhn., Fragm. z. Myk. 10 (1910) No. 482. See also Theissen in Ann. Myc. 10 (1910) p. 16 and Doidge in Trans. Roy. Soc. S. Afr. 5 (1917) p. 715.

***Asterina solaris* Kalch. et Cke.**

Grevillea IX (1880) p. 33.

On leaves, Cape, MacOwan 1307, Rabh. Fung. Eur. 3651.

This is *Asterodothis solaris* (K. & Cke.) Theissen in Ann. Myc. 10 (1912) p. 179; see also Theissen and Sydow in Ann. Myc. 13 (1915) p. 232 and Doidge in Bothalia I (1921) p. 10.

***Asterina sphaerasca* Thüm.**

Fung. austro-afric. 119, in Flora (1878) p. 356.

On living leaves of *Capparis Gueinzii* Sond., Olifants Hoek, Uitenhage District, leg. B. Holland (MacOwan 1273).

The following is the original description of this fungus: "Mycelio vel stromate tenui, plus minusve orbiculato, stellato-dendritico, nigro; hyphis inaequalibus griseo-fuscis, repentibus, longis, ramosis; peritheciis minutis, numerosis, granuloso-punctiformibus; ascis exacte sphaericis, episporio crassissimo laevi, quadrisporis, hyalinis vel flavescentibus, 35 μ diam.; sporis ellipticis, utrinque rotundatis, bicellularibus, medio constrictis, dilute flavidis demum fusciculis, pellucidis, 20 μ longis, 12 μ crassis".

It has not been possible to trace the type specimen of this species; MacOwan 1273 is missing from the MacOwan collections in the Pretoria Herbarium and from those in the South African Museum, Capetown, nor is it to be found at Kew. In a previous publication

9) this name was given to No. 9010 on *Capparis citrifolia*, now described as *Asterina elegans*. The description might equally well apply to *A. Woodii*, *A. capparidicola* or *A. Capparidis* Syd., all of which occur on *Capparis* spp.

Theissen includes this fungus in his "Species non visae vel dubiae" and it must be regarded as a doubtful species until the type is found.

***Asterina* ? *stylospora* Cke.**

Grevillea X (1882) p. 129.

On *Sponia guineensis*, on leaves, Inanda, Medley Wood 564.

Theissen (37, p. 13 and 41, p. 36) says "Die Art ist zu streichen" but on p. 100 of the latter publication quotes it as a possible synonym for *Asterina Sponiae* Rac., and the species is thus placed by Stevens and Ryan (32, p. 71).

Abundant material of this fungus is now available; it is a form with conidia similar to those of *Asterostomella*, but the pycnidia are subglobose and not radial in structure. *Oothecium consimile* Syd. on the same host from Sierra Leone is evidently the same fungus. It differs widely from *Asterina Sponiae* in mycelial characters and hyphopodia, and may be described as follows.

***Oothecium stylosporum* (Cke.) Doidge, nov. comb.**

Syn.: *Asterina stylospora* Cke., Grev. X (1882) p. 129.

Oothecium consimile Syd., Ann. Myc. 28 (1930) p. 443.

Colonies always hypophyllous, black, more or less circular, ca. 1-3 mm. diam., scattered over the whole leaf surface, often numerous and crowded, becoming confluent and thus covering larger, irregular areas of the leaf. Mycelium pale, consisting of hyphae at first radiating, but soon becoming tangled and interwoven, sometimes forming loose strands. Hyphae thin-walled, greyish olive to cirrine drab, uneven in thickness, mostly 4-6 μ thick (3-4.5 μ *vide* Sydow) more or less undulating, obscurely septate, branching freely and irregularly. Hyphopodia not very numerous, alternate, septate, 11-32 μ long; basal cell straight or curved, usually more or less cylindrical, 3-25 μ long, 3-4 μ broad; terminal cell usually broadly clavate, with rounded or flattened apex, 9-13 μ long, 6-9 μ broad (those with a long stipe are regarded by Sydow as short, lateral, hyphal branches closely resembling true hyphopodia).

Pycnidia produced in great numbers, often in closely crowded groups, globose or globose-ovate, very variable in size, 60-100 μ diam.; at first quite closed; wall membranous, consisting of irregularly polyhedral pellucid, olive brown cells, 5-9 μ diam., which, at maturity break down, through mucilaginous histolysis, beginning at the apex. Conidia produced very freely, deep olive brown to olive brown with a distinct hyaline medial band 2-3 μ broad, very variable in form, mostly ovate to oblong, less frequently pyriform, ellipsoid or subglobose, usually broadly rounded above but with a short, pale mucro up to 3 μ long, usually tapering more or less to the base. The conidia are borne on the inner surface of the wall of the pycnidium on truncate-conical conidiophores.

On *Trema guineensis* (Schum.) Ficalho (= *Sponia Guineensis* Planch.) Inanda, Medley Wood 564 (Type, collection) 793, 9499, 10191; Verulam, *Pole Evans*, 6801; Krantzklouf, Doidge, 9101.

***Asterina tenuis* Wint.**

Hedwigia 25 (1886) p. 94; Sacc. Syll. Fung. IX, p. 389; see also Theissen, Die Gattung *Asterina* (1913) p. 116 and Doidge, Trans. Roy. Soc. S. Afric. 8 (1920) p. 250.

Asterina tenuis was originally described "on living leaves of a tree" from the island of S. Thomé.

Theissen (loc. cit.) states that in various herbaria are to be found specimens under this name, from Natal, on leaves of *Kraussia coriacea*, and on leaves of other plants (Medley Wood 6452, 6458), which differ from the original. This name was applied to Medley Wood's collection 6458b in a previous publication (Doidge loc. cit.).

A discussion of fungi found under this name in Medley Wood's collections has been given after the descriptions of *Asterina radiofissilis*, *A. Woodii* and *Asterolibertia meqathyria*.

***Asterina toruligena* Cke.**

Grevillea X (1882) p. 129.

On living leaves, Inanda, Medley Wood 559.

The type specimen of this fungus in the Kew Herbarium was examined by Theissen, who found no recognisable Microthyriaceous ascomata; nor are mature ascomata to be

found on the portions of the type collections in the Pretoria Herbarium. The few round, opaque bodies present, if they are ascomata, contain no asci. The asci and spores described by Cooke can therefore not be found on the type collection. Unfortunately the collection consists of a few detached leaves and the host is undeterminable. The mycelium consists of brown hyphae radiating from the centre of the colony; they are not hyphopodiate and give rise freely to oval, 1-celled, brown conidia. The material is scanty and fresh collections will be necessary if a complete study of the fungus is to be made. It is definitely not an *Asterina*.

Englerulaster Gymnosporiae (P. Henn.) Theiss.

Beihefte Bot. Centralb. (1912) p. 51.

On leaves of *Gymnosporia buxifolia*, Natal.

This fungus was originally described by Hennings under the name *Dimerosporium Gymnosporiae* (Sacc. Syll. Fung. XVI p. 406). A collection made in Mozambique by Howard (Myc. Herb. Pretoria No. 523) was identified by Sydow (Ann. Myc. 7, 1909, p. 546) as *Dimerium Gymnosporiae* (P. Henn.) Syd., but unfortunately the remaining portion of this material is fragmentary and the leaves bear only one colony of *Asterina dissiliens*; there is therefore no authentically named material of *Englerulaster Gymnosporiae* in the Pretoria Herbarium for comparison with recent collections.

Petrak (Ann. Myc. 32, 1934, p. 432) has redescribed this fungus as *Parenklerula Henningsii* Petrak, but from his description it might well be a form of *Parenklerula MacOwaniana* (Thüm.) v. Höhn., which is a very common and somewhat variable species. As Arnaud (3, p. 183) points out, both fungi were collected on *Gymnosporia buxifolia* in Natal and the Eastern Cape. *P. MacOwaniana* has been found on species of *Gymnosporia*, *Putterlickia* and *Cassine*, the form on *Cassine* having been described by Werdermann (46) as a distinct variety, var. *Elaeodendri* on *Elaeodendron Kraussianum* (= *Cassine Kraussiana*).

Englerulaster MacOwaniana (Thüm.) Arn.

Ann. École Nat. Agr. Montp. 16 (1918) p. 183.

This is *Parenklerula MacOwaniana* (Thüm.) v. Höhn.; see *Asterina MacOwaniana*.

Eupelte amicta Syd.

Ann. Myc. 22 (1924) pp. 426, 427, cum icones.

On leaves of *Olea laurifolia*, Haenertsburg, Transvaal, van der Byl 1510.

Sydow states that this fungus is quite superficial, and although the structure of the ascomata is not radiating in the strict sense, assigns it to the Microthyriaceae. He had, however, to make his studies from very sparse material.

In a number of sections made from the type collection, and from other collections in the Pretoria Herbarium, it was found that the superficial mycelium is connected at many points through the cuticle and also through the stomata, with a colourless hypostroma, which almost fills the epidermal cells of the leaf of the host.

It seems, therefore, that in the system of classification adopted by Theissen and Sydow (43), this fungus is more suitably placed in the Polystomellaceae.

Lembosia congesta Wint.

Exot. Pilze in Flora (1884) p. 9.

On *Carissa arduina*, on leaves, Cape, MacOwan 1292.

This is *MacOwaniella congesta* (Wint.) Doidge, in Bothalia I (1921) p. 9.

Lembosia radiata Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) p. 269.

On shrub undet. (Leguminosae) Rikatli, Junod, 11729.

This is *Schneepia radiata* Doidge, in Bothalia I (1921) p. 5.

Morenoella Oxyanthae Doidge.

Trans. Roy. Soc. S. Afr. 8 (1920) pp. 270, 281.

This is *Hysterostomina Oxyanthae* Doidge, Bothalia 2 (1927) p. 232.

Phragmothryrium Marattiae (P. Henn.) v. Höhn.

Sitzber. K. Akad. Wiss. Wien 121 (1912) p. 347.

On *Marattia fraxinea*.

This fungus was described by von Thümen as *Leptosphaeria caffra* (Fung. austro-afric. 32 in Flora, 1876, p. 363); it was called *Sphaeria caffra* Kalch. et Cke. in Grevillea IX (1880) p. 30 and *Micropeltis Marattiae* P. Henn. in Hedwigia 34 (1895); and in Ann. Myc. 14

(1916) p. 450, Theissen and Sydow established the genus *Phragmosperma*, and renamed this fungus *Phragmosperma Maraltiae*.

In the *Ann. Myc.* 25 (1927) pp. 261-262, Petrak, as a result of a critical study of more recent collections, recorded the presence of a parenchymatic stromatal tissue between the perithecia, and retransferred the fungus to the Sphaeriaceae under the name *Metasphaeria caffra* (Thüm.) Petr.

Phragmothyrus Trichomanis (P. Henn.) v. Höhn.

Sitz. K. Akad. Wiss. Wien, 121 (1912) p. 347.

On leaves of *Trichomanes pyxidifera*, Natal, Medley Wood.

The type specimen has not been seen, but a fungus has been found on another collection of this host which agrees with the original description; in this fungus, the structure of the covering membrane of the thyriothecium is not radial, and it obviously belongs to the Hemosphaeriaceae. It seems preferable, therefore, to retain the original name, *Micropeltis Trichomanis* P. Henn. [*Engl. Bot. Jahrb.* XXVIII (1900) p. 326] for this fungus.

Seynesia orbiculata Syd.

Ann. Myc. 10 (1912) p. 39.

On *Euclea natalensis*.

This fungus does not belong to the Microthyriaceae; it has a distinct, epidermal hypostroma and is identical with the fungus described as *Palawaniella Eucleae* Doidge. It must therefore be known as *Palawaniella orbiculata* (Syd.). Doidge nov. comb. Syn.: *Palawaniella Eucleae* Doidge in *Bothalia* I (1921) p. 17, fig. 3.

ASTEROSTOMELLA FORMS.

A number of species of *Asterina* very rarely produce thyriothecia, but it is often possible to recognise them by the mycelium and conidia. The following key is an attempt to distinguish species of *Asterina* without reference to the thyriothecia; two species of *Asterostomella* are included, of which the ascus stage is not known. No *Asterostomella* conidia have been seen in association with South African species of *Asterina* belonging to the sections *Parasterina* and *Englerulaster*.

In the key, A=*Asterina*, and the numbers refer to descriptions in earlier pages; Ast.=*Asterostomella*.

KEY TO ASTEROSTOMELLA—FORMS.

A.—Conidia brown; colour continuous, without hyaline or lighter band; no conspicuous germ pores.

(a) Germination from the basal end.

- | | |
|---|----------------------------|
| 1. Hyphopodia 2-celled, lobed..... | 47. <i>A. peraffinis</i> . |
| 2. Hyphopodia continuous, pyriform..... | 21. <i>A. crotoniensis</i> |

(b) Germination lateral.

1. Hyphopodia mostly septate.

- | | |
|--|--------------------------|
| x. Hyphopodia few, 1-5-celled, apical cell usually clavate or cylindrical..... | 30. <i>A. Woodiana</i> . |
| xx. Hyphopodia fairly numerous, mostly 2-celled, slender, cylindrical..... | 50. <i>A. elegans</i> . |

2. Hyphopodia continuous, more or less lobed.

x. Hyphopodia with shallow lobes.

- | | |
|---|-----------------------------|
| o. Pycnidia with basal membrane, conidia 17.5-25 × 15-20 μ..... | 44. <i>A. Excoecariae</i> . |
|---|-----------------------------|

oo. Pycnidia without basal membrane—

- | | |
|------------------------------------|--------------------------|
| (i) Conidia 19-24 × 13-17.5 μ..... | 19. <i>A. delicata</i> . |
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|-----------------------------------|---------------------------|
| (ii) Conidia 14-24 × 10-13 μ..... | 25. <i>A. Paxsoniae</i> . |
|-----------------------------------|---------------------------|

xx. Hyphopodia deeply lobed.

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|--|----------------------------|
| o. Conidia broadly ovate to globose, 13.5-19 × 12-14 μ.... | 43. <i>A. diplocarpa</i> . |
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- | | |
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| oo. Conidia ovate to pyriform, 11-18 × 10-13 μ..... | 42. <i>A. tertia</i> ,
var. <i>africana</i> . |
|---|--|

B.—Conidia with conspicuous germ pores, but no lighter medial band.

(a) Hyphopodia 2-celled, cylindrical. Conidia rhomboid, with 4 papillate germ pores at the angles.....

33. *A. Scolopiae*.

(b) Hyphopodia continuous. Conidia ovate with equatorial germ pores.

- | | |
|--|----------------------------|
| 1. Germ pores, 4 in one band. Hyphopodia lobed..... | 40. <i>A. clausenica</i> . |
| 2. Germ pores, 4 or 8 in one or two bands. Hyphopodia finger- or flask-shaped, rarely lobed..... | 20. <i>A. Grewiae</i> . |

C.—Conidia with a more or less distinct, hyaline or pale medial band.

(a) Pyrenidia with basal membrane.

1. Hyphopodia continuous.

x. Hyphopodia lobed.

- o. Conidia 7.5–11 μ broad..... 39. *A. polythyria*.
 oo. Conidia 10–15 μ broad..... 41. *A. crysiphoides*.
 ooo. Conidia 15–20 μ broad..... 44. *A. Excoecariae*.
 xx. Hyphopodia cylindrical, not lobed..... 38. *A. loranthicola*.

2. Hyphopodia 2-celled.

x. Hyphopodia deeply lobed.....

53. *A. Rinorea*.

xx. Hyphopodia with shallow lobes or subentire, mostly alternate.

- o. Hyphopodia 3–4 μ broad..... 45. *A. Fleuryae*.
 oo. Hyphopodia 5–10 μ broad.

(i) Medial band in conidia distinct.

- y. conidia 11–15 \times 7–9 μ 48. *A. radio-fissilis*.
 yy. Conidia 14–20 \times 8–12.5 μ 49. *A. africana*.

- (ii) Medial band indistinct. Conidia 17.5–20 \times 9–10 μ 46. *A. van der Bylii*.

- ooo. Hyphopodia not lobed, mostly opposite. Conidia 15–21 \times 10–12.5 μ 51. *A. capparidicola*.

(b) Pyrenidia without basal membrane.

1. Hyphopodia continuous, 1-celled.

x. Hyphopodia lobed.

- o. Conidia 10–14 \times 4–6 μ 26. *A. xumensis*.
 oo. Conidia 16–20 \times 7.5–10 μ 20a. *A. Grewiae*,
 var. *zonata*.

xx. Hyphopodia not lobed.

- o. Conidia 15–22 μ long.

- (i) Conidia 7.5–9 μ broad..... 20a. *A. Grewiae*,
 var. *zonata*.

- (ii) Conidia 10–12.5 μ broad..... *Ast. Visci*.

- oo. Conidia 20–30 \times 10–15 μ 16. *A. Hendersoni*.

2. Hyphopodia mostly 2-celled.

x. Conidia mostly 15–20 μ long.

- o. Hyphopodia 4–5 μ broad, basal cell 3.7–5 μ long; pyrenidia 100–150 μ diam..... 32. *A. reticulata*.

- oo. Hyphopodia 5–6 μ broad, basal cell 4–10 μ long; pyrenidia 75–120 μ diam..... *Ast. eugenicola*.

- xx. Conidia 18–26 \times 9–13 μ ; Pyrenidia 60–90 μ diam..... 36. *A. Combreti*.

***Asterostomella eugenicola* Doidge nov. spec.**

Colonies amphigenous, black, more or less round to irregular in outline; sometimes scattered, discrete, up to 4 mm. diam.; more frequently numerous, crowded, becoming confluent and covering large areas of the leaf surface.

Mycelium at first radiating, becoming more or less closely reticulate. Hyphae almost straight, dark olive buff to buffy brown, 4–5 μ thick, cells mostly 20–30 μ long, branching irregular, often opposite. Hyphopodia fairly numerous, alternate or unilateral, rarely opposite, straight, curved or hooked, usually erect, less frequently inclined towards the hypha, 12–20 μ , usually 12.5–15 μ long, 2-celled; basal cell cylindrical, 4–10 μ long and 5 μ broad; apical cell variable, usually cylindrical to ovate, rounded above, sometimes truncate, sometimes sublobed and irregular in form, 7.5–11.5 μ long, 5–9 μ , mostly 5–6 μ broad.

Pyrenidia very numerous, often crowded, circular in outline or somewhat elongated, 75–120 μ diam. Basal layer hyaline, structure not evident. Covering membrane slightly convex, pellucid, buffy brown, becoming darker and subopaque in the centre, composed of straight, radiating hypha 2.5–4 μ thick, central cells almost cubical, marginal cells longer, up to 6 μ long; central cells breaking down irregularly at maturity. Conidia fairly numerous, oblong or ovate-oblong, buffy brown with a paler medial band, 15–21.5 \times 7.5–10 μ .

On *Eugenia natalitia* Sond., on leaves, Hogsback, J. & M. Henderson, 11340.

A number of larger, dimidiate bodies, 150–160 μ diam., are apparently immature thyrrothecia, but no asci or spores were seen.

***Asterostomella Visci* Doidge nov. spec.**

Colonies amphigenous, rather thin, dull black, circular to irregular in outline, scattered or rather closely crowded and becoming confluent, not sharply defined.

Mycelium reticulate. Hyphae snuff brown to cinnamon brown, almost straight or more or less undulating, 5–6 μ thick, closely septate, cells 10–17.5 μ long, branching irregular. Hyphopodia fairly numerous, unilateral or alternate, continuous, usually subglobose, less frequently briefly cylindrical, or sublobed and more or less irregular in form, 8–12 μ long and 7–9 μ broad.

Pycnidia numerous, circular in outline, often becoming confluent in small groups and flattened by lateral pressure, 50–120 μ diam. Basal layer hyaline, without recognisable structure. Covering membrane slightly convex, pellucid, snuff brown to cinnamon brown, formed of straight, radiating hyphae 4–6 μ thick, with cells almost cubical, 4–5 μ long, not fringed at the margin; central part developing numerous radiating cracks, running out almost to the margin, and finally breaking down irregularly. Conidia fairly numerous, snuff brown with a rather indistinct paler medial band, ovate, oblong or broadly ellipsoid, 15–21 \times 10–12.5 μ .

On *Viscum obscurum* Thunb., on leaves, Assegai Bush, Humansdorp Distr., Doidge, 17237; Langholm Estates, Bathurst, Doidge, 12366; Belmont Valley, Grahamstown, Doidge, 10951; Knysna, Bottomley, 32114, 32237.

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LATIN DESCRIPTIONS OF NEW SPECIES.

Asterina africana (van der Byl) Doidge var. **Kiggelariae** Doidge nov. var.

Sub *Asterina celtidicola* P. Henn. var. *microspora* Doidge in *Bothalia* I (1924) p. 204.

Plagulae semper epiphyllae. Mycelium ex hyphis radiantibus vel laxe reticulatis compositum. Hyphopodia typo simul sed 8–20 μ longa, 6–9 μ lata; cellula basali plus minus cylindracea, 3–12.5 μ longa et 3–5 μ crassa. Thyriothechia numerosa, 100–150 μ diam., membrana basali indistincta, subhyalina; strato tegente ex hyphis radiantibus, rectis, 2–3 μ crassis, articulis in parte centrali ca. 4–5 μ longis, marginem versus leniter elongatis composito, ad peripheriam plus minus fimbriato. Sporae 8.5–11 μ latae, minute verruculosae. Conidia 10–17.5 \times 8.5–11.5 μ .

Hab. in foliis *Kiggelariae africanae* L., in silvis Keurkloof, George, leg. Doidge.

Asterina Bosmanae Doidge nov. spec.

Plagulae epiphyllae, sparsae, plus minus orbiculares, ateo-griseae, 2–5 mm. diam. Mycelium ex hyphis rectiusculis vel interdum leniter undulatis, laxe reticulato-ramosis, olivaceo-brunneis, 3–5 μ crassis compositum; hyphopodia sat numerosa, unilateralia vel alternantia, continua, breviter cylindrica v. subglobosa, 5–7.5 μ longa, 4–5 μ rarissime usque 6 μ lata. Thyriothechia sparsa, ambitu plerumque orbicularia, 150–180 μ diam.; membrana basali tenui, subhyalina; strato tegente leniter convexo, opace atro-brunneo, ex hyphis radiantibus 2.5–4 μ crassis, marginem pellucidem versus 7–10 μ longis composito, periphice haud vel leniter fimbriato, in maturitate in lacinias paucas irregulariter fisso. Asci pauci, 8-spори, ovati, sessiles, firme crasseque tunicati, 40–57 \times 30–35 μ . Sporae conglobatae, oblongae, utrinque rotundatae, 4-septatae, valde constrictae, ex hyalino mox zonatae, deinde obscure brunneae, 21–24 μ longae, cellula superiore 11–12.5 μ longa, 11–11.5 μ lata, inferiore 10–11.5 μ longa, ca. 10 μ lata.

Hab. in foliis *Chrysophylli magaliesmontani* Sond., Rooiwal, Transvaal, leg. Bosman, 32808.

Asterina Bottomleyae Doidge nov. spec. ✓

Plagulae amphigenae plerumque epiphyllae, irregulariter dispersae, primitus plus minus orbiculares acutiuscule limitatae usque 5 mm. diam., dein saepe confluentes et magnam folii partem occupantes. Mycelium ex hyphis radiantibus, rectis vel leniter sinuosis, brunneis, 6.5–7.5 μ crassis, septatis (articulis 15–25 μ longis) opposite ramosis compositum, hyphopodia numerosa, plerumque opposita, rarius unilateralia vel alternantia, breviter cylindracea v. piriformia, 10–14 μ longa, 6.5–7.5 μ lata. Thyriothechia plus minus dense disposita, ambitu plerumque orbicularia, 120–160 μ vel usque 200 μ diam.; strato tegente alte convexo, ex hyphis radiantibus in parte centrali opace atro-brunneis, peripheriam versus pellucide brunneis plus minus tortuosis 5 μ crassis, contexto. Asci haud numerosi, 4–8-spори, ovati vel subglobosi, sessiles, 65–80 \times 58–60 μ , firme tunicate. Sporae conglobatae, oblongae, utrinque rotundatae, 1-septatae, fortiter constrictae, brunneae, minute verruculosae, 33–39 μ longae; cellula superiore 17.5–20 μ diam., inferiore 15–19 μ .

Hab. in foliis *Ilicis mitis* (L.) Radlk., prope Mont-aux-Sources, leg. Bottomley, 23406.

Asterina capparidicola Doidge nov. spec. ✓

Plagulae amphigenae sed plerumque epiphyllae, atrae, primitus densiuscule sparsae, ambitu orbiculares vel parum irregulares, minutae, confluendo subinde majores et magnam folii partem occupantes vel discretae et usque 5 mm. diam. Mycelium ex hyphis ca. 5 μ crassis, rectiusculis v. leniter undulatis, densiuscule reticulato-ramosis, olivaceo-brunneis compositum; hyphopodia numerosa, plerumque opposita, 2-cellularia, 10–15 μ longa, recta v. leniter curvata, cellula inferiore cylindracea, ca. 5 μ crassa et 2–3 μ longa, superiore subglobosa v. late cylindracea, 5.5–7.5 μ crassa. Thyriothechia dense dispersa, ambitu sat regulariter orbicularia, 110–140 μ diam.; membrana basali distincta, fumoso-griseola; strato tegente convexulo, primitus omnino clauso, dein stellatim dehiscente, ex hyphis opace atro-brunneis, radiantibus, 3–4 μ crassis composito, periphice plus minus fimbriato. Asci globosi v. late ovati, sessiles, 32–43 \times 27.5–37.5 μ . Sporae conglobatae, olivaceo-brunneae, oblongae, utrinque late rotundatae, 1-septatae, sat fortiter constrictae, 22–27.5 μ longae, cellula superiore 12.5–15 μ longa et 11.5–13.5 μ lata, inferiore 10–12.5 μ longa et

10–11.5 μ lata, minute verrucoso-echinulatae. Pycnidia simul praesentia minora, usque 100 μ diam. Conidia ovata v. oblonga, olivaceo-brunnea, 17–25 \times 12–15 μ , plerumque zonula hyalina aegre perspicua praedita.

Hab. in foliis *Capparis Zeyheri* Turcz., Alexandria, leg. Doidge, 22361.

Asterina diplocarpa Cke. var. *Hibisci* Doidge nov. var.

Mycelium ex hyphis irregulariter radiantibus deinde laxe reticulate-ramosis, undulatis, 2.5–3.5 μ crassis compositum. Hyphopodia pauca, alternantia v. unilaterialia, 5–11.5 μ longa, 7.5–15 μ lata. Thyriothecia numerosa, 100–130 μ diam. Asci subglobosi v. ovati, 25–33 \times 22.5–25 μ . Sporae oblongae, circa medium septatae et constrictae, minute verrucosae, 17–20 \times 9–10 μ ; cellula superiore paullo latiore. Pycnidia numerosa, 70–80 μ diam.; conidia 16–18 \times 13–15 μ . Alioque typo simul.

Hab. in foliis *Hibisci pedunculati* Cav., Van Staden's Pass, C.B.S., leg. Doidge, 17258.

Asterina dissiliens (Syd.) Doidge var. *senegalensis* Doidge nov. var.

Mycelium reticulatum ex hyphis valde undulatis, 4–5 μ crassis compositum; hyphopodia hemisphaerica, ovata v. ampullacea, inter dum erecta, usque 10 μ longa et lata. Sporae latiores, cellula superiore 11–11.5 μ lata, inferiore 9–10 μ lata. Alioque ut in typo.

Hab. in foliis *Gymnosporiae senegalensis*, Rikatli, Mozambique, leg. Junod, 11725.

Asterina elegans Doidge nov. spec.

Plagulae plerumque epiphyllae, atrae, densiuscule dispersae, ambitu plus minus orbiculares, usque 5 mm. diam., confluyendo interdum majores et magnam folii partem occupantes. Mycelium ex hyphis reticulato-ramosis, rectiusculis v. leniter undulatis, olivaceo-brunneis, 3–6 μ crassis compositum. Hyphopodia numerosa, opposita, alternantia v. unilaterialia, 2-cellularia, cylindracea, recta v. leniter curvata, 12–20 μ longa et 4–6 μ lata, cellula basali 5–7.5 μ longa, apicali integra, cylindracea, ad apicem leniter attenuata. Thyriothecia numerosa, dense dispersa, sat regulariter orbiculares, 130–170 μ diam.; membrana basali distincta, fumoso-griseola; strato tegente convexo, ex hyphis radiantibus, rectiusculis, cellularum in parte centrali fere isodiametricarum, 3.5–4 μ longarum et 3–4 μ laterum, marginem versus leniter elongatarum composito, in maturitate laciniis anguste triangularibus stellatim dehiscente, periphice fimbriato. Asci subglobosi vel ovati, sessiles, 8-spori, crasse tunicati, 45–50 \times 35–42 μ . Sporae conglobatae brunneae, oblongae, circa medium septatae et constrictae, utrinque late rotundatae, 22–25 μ longae, verrucis acutiusculis dense obsitae, cellula superiore 11–12.5 μ lata, inferiore 9–10.5 μ lata. Pycnidia simul praesentia, 100–120 μ diam. Conidia brunnea, ovata, 20–25 \times 12–15 μ .

Hab. in foliis *Capparis citrifoliae* Lam., Winkle Spruit, Natal, leg. Doidge, 9010.

Asterina papillata Syd. affinis.

Asterina Fleuryae Doidge nov. spec.

Plagulae semper epiphyllae, tenues et parum perspicuae, minutae, 1–2.5 mm. diam., laxe v. densiuscule sparsae, saepe confluentes. Mycelium ex hyphis valde undulatis, 3–4.5 μ crassis compositum; hyphopodia haud numerosa, alternantia v. unilaterialia, raro opposita, recta v. curvata, bicellularia, 9–19 μ longa, cellula basali 1.5–10 μ longa, cylindracea, recta v. curvata, 3–4 μ crassa v. plus minusve gibbosa et usque 7 μ crasse, apicali recta v. curvata, integra, 3–4 μ crassa, vel ad apicem dilatata, 2–4-lobulata et usque 10 μ lata. Thyriothecia laxe vel densiuscule dispersa, tunc saepe plura densissime aggregata et paullo conjuncta vel confluenta, ambitu orbicularia, saepe leniter irregulariter angulosis, 2.5–3.5 μ diam. metientibus, marginem versus in series radiantes 2.5–3.5 μ lato dispositis, in maturitate in laciniis triangularibus dehiscente, ambitu plus minus fimbriato. Asci sat numerosi, 8-spori, ovati vel subglobosi, crasse et firme tunicati, 25–35 \times 17–20 μ . Sporae conglobatae, oblongae, utrinque rotundatae, 1-septatae, leniter constrictae, pellucide olivaceo-brunneae, leves, 12–15 \times 5–6.5 μ , cellulis subaequalibus v. cellula superiore parum latiore.

Hab. in foliis *Fleuryae* sp., Woodbush, Transvaal, leg. Doidge, 28349.

Asterina Phenacis Syd. affinis.

Asterina Grewiae Cke. var. *zonata* Doidge nov. var.

Hyphopodia frequentius uncinata vel sublobata quam in typo. Conidia ellipsoidea v. subclavata, $16-21.5 \times 7.5-9 \mu$, olivaceo-brunnea, zonula hyalina perspicua praedita.

Hab. in foliis *Trimeriae trinervis* Harv., Howieson's Poort, prope Grahamstown, leg. Doidge, 12382.

Asterina Knysnae Doidge nov. spec.

Plagulae amphigenae, plus minus orbiculares, atro-grisea, usque 5 mm. diam. Mycelium laxè reticulatum, ex hyphis rectiusculis v. leniter tortuosis, olivaceo-brunneis, $6-7.5 \mu$ crassis compositum. Hyphopodia numerosa, unilateralia v. alternantia, raro opposita, continua, cylindracea v. piriformia, recta v. curvata, $10-15 \mu$ longa, $8-10 \mu$ lata. Thyriothecia laxè v. densiuscule sparsa, ambitu plus minus orbicularia, $120-150 \mu$ diam.; membrana basali distincta nulla; strato tegente leniter convexulo, ex hyphis radiantibus $2.5-5 \mu$ crassis composito, in parte centrali opaco, marginem versus pellucido, periphice fimbriato, prinitus omnino clauso, tandem in parte centrali irregulariter disrumpente. Asci paraphysati, subglobosi v. ovati, sessiles, 8-spori, $50-57.5 \times 40-50 \mu$, firme crasseque tunicati. Sporae conglobatae, olivaceo-brunneae, oblongae, utrinque late rotundatae, 1-septatae, constrictae, minute denseque verruculosae, $30-35 \mu$ longae, cellula superiore $16-17.5 \mu$ lata, inferiore $14-15 \mu$ lata. Paraphyses hyalinae, filiformes, $1.5-2 \mu$ crassae.

Hab. in foliis *Canthii ciliati*, in silvis, Deepwalls, Knysna, leg. Doidge, 17226.

Asterina natalitia Doidge nov. spec.

Plagulae epiphyllae, sparsae, tenues, griseo-atrae, haud acute definitae, usque 5 mm. diam. Mycelium ex hyphis olivaceo-brunneis, rectiusculis v. leniter undulatis, plerumque $4-5 \mu$ crassis, irregulariter remoteque ramosis compositum. Hyphopodia alternantia v. unilateralia v. nonnunquam opposita, sat numerosa, continua, cylindracea, raro ovata v. irregularia, $7.5-13 \mu$ longa, $5-6.25 \mu$ lata. Thyriothecia laxè vel densiuscule sparsa, ambitu plus minus orbicularia, $200-300 \mu$ diam.; strato tegente convexo, in parte centrali opaco atro-brunneo, ex hyphis radiantibus ad marginem pellucidem fimbriatum ca. $2.5-3 \mu$ crassis composito, prinitus omnino clauso, dein irregulariter dehiscente. Asci sat numerosa, 8-spori, ovati vel ellipsoidei, sessiles, $50-65 \times 35-42.5 \mu$, firme crasseque tunicati. Sporae conglobatae, olivaceo-brunneae, oblongae, utrinque rotundatae, 1-septatae, sat valde constrictae, leves, $30-40 \mu$ longae, cellula superiore $16-17.5 \mu$ longa et $12.5-14 \mu$ lata, inferiore $15-16 \mu$ longa et $10-12.5 \mu$ lata. Paraphyses filiformes, numerosae, $1.5-2.5 \mu$ crassae, apice subclavatae et usque 5μ crassae, ascos superantes.

Hab. in foliis *Eugeniae natalitiae*, in silvis, Woodbush, Transvaal, leg. Doidge, 17751.

Asterina nodosa Doidge nov. spec.

Plagulae epiphyllae, sparsae, ambitu plus minus orbiculares, usque 5 mm. diam., atrae. Mycelium ex hyphis reticulato-ramosis, toruloso-curvatis, brunneis, $3.75-7.5 \mu$ crassis compositum. Hyphopodia alternantia v. unilateralia, continua, plerumque irregulariter cylindracea, raro recta, plerumque plus minus curvata, interdum integra, saepe torulosa vel obtuse et varie lobata, $7-12.5 \mu$ longa, $6-10 \mu$ lata; rarissime 2-cellularia et usque 17.5μ longa. Thyriothecia numerosa, laxè v. densiuscule disposita, ambitu plerumque torulata, $100-150 \mu$ diam.; membrana basali indistincta; strato tegente alte convexulo, opaco atro-brunneo, ex hyphis irregulariter radiantibus, $2.5-4 \mu$ crassis, cellulis plerumque $5-10 \mu$ longis composito. Asci late ovati v. subglobosi, sessiles, 8-spori, $37-45 \times 35-40 \mu$. Sporae conglobatae, oblongae, utrinque rotundatae, circa medium septatae, constrictae, brunneae, minute et remote verruculoso-echinulatae, $23-28 \mu$ longae, cellula superiore $12-15 \mu$, inferiore $11-12.5 \mu$ lata.

Hab. in foliis *Nicotianae glaucae* (L.) Radlk., in silvis Woodville, George, leg. Doidge, 10943.

Asterina Rinorea Doidge nov. spec.

Sub *Asterina* ? *vagans* Speg. in Trans. Roy. Soc. S. Afr. 8 (1920) p. 261.

Plagulae amphigenae, minutae v. plus minus effusae, tenues, parum perspicuae. Mycelium ex hyphis rectiusculis v. parum undulatis laxè reticulato-ramosis, ca. 5μ crassis compositum. Hyphopodia sat numerosa, alternantia v. unilateralia, 2-cellularia, $9-17.5 \mu$ longa, cellula basali cylindracea, $3-6 \mu$ nonnunquam usque 12.5μ longa et 5μ lata, superiore plerumque irregulariter 2-3-lobata, $8-12.5 \mu$ lata. Thyriothecia laxè dispersa, ambitu plus minus orbicularia, $100-160 \mu$ diam.; membrana basali tenui, dilute brunneola; starte

tegente ex hyphis radiantibus, 3-3.5 μ latis, pellucide olivaceo-brunneis, cellulis 5-7.5 μ longis composito, in maturitate laciniis triangularibus irregulariter stellatim dehiscente, ad peripheriam fimbriato. Asci ovati v. subglobosi, 8-spori, 33-37 \times 33-35 μ . Sporae, conglobatae, oblongae, utrinque late rotundatae, circa medium septatae et constrictae 20-24 \times 11-12.5 μ , verruculoso-echinulatae. Pycnidia simul praesentia minora, 50-60 μ diam. Conidia brunnea, ovata v. pyriformia, 15-18 \times 10-11 μ , zonula hyalina aegre perspicua praedita.

Hab. in foliis *Rinorea natalensis*, Buccleuch, Natal, leg. Doidge, 9704.

Asterina Saniculae Doidge nov. spec.

Plagulae amphigenae, atrae, ambitu plus minus orbiculares, irregulariter dispersa, confluyendo saepe majores. Mycelium ex hyphis reticulato-ramosis, olivaceo-brunneis, valde undulatis, 3-5 μ crassis compositum. Hyphopodia alternantia v. unilateralia, 2-cellularia, recta v. curvata, 10-15 μ longa, cellula basali 2.5-7.5 μ longa, cylindracea, 3.5-4 μ lata, apicali irregulariter 2-5-lobata, 7.5-11 μ lata. Thyriothecia in centro plagarum dense dispersa, haud raro dense conferta et omnino confluentia, ambitu plerumque orbicularia 100-130 μ diam.; membrana basali tenui, subhyalina; strato tegente convexulo, ex hyphis radiantibus atro-brunneis cellularum in parte centrali fere isodiametricarum, 2.5-5 μ longarum et 2.5-3.5 μ latarum, marginem versus leniter elongatarum et usque 8 μ longarum composito, in maturitate laciniis triangularibus stellatim dehiscente, periphice haud vel leniter fimbriato. Asci 8-spori, ovati v. subglobosi, firme crasseque tunicati, sessiles, 20-25 \times 17.5-20 μ . Sporae conglobatae, dilute olivaceo-brunneae, oblongae, circa medium septatae et leniter constrictae, utrinque rotundatae, leves, 12.5-15 μ longae, cellula superiore 5-6.25 μ lata, inferiore saepe leniter angustiore.

Hab. in foliis *Saniculae europaeae* L., Woodbush, Transvaal, leg. Doidge, 28331.

Asterina Syzygii Doidge nov. spec.

Sub *Parasterina brachystoma* (Rehm.) Theiss., in Trans. Roy. Soc. S. Afr. 8 (1920) p. 245.

Plagulae plerumque epiphyllae, atrae, crustaceae, ambitu plus minus orbiculares, usque 5 mm. diam. vel raro usque 10 mm. Mycelium ex hyphis radiantibus, castaneo-brunneis, rectiusculis v. plus minus tortuosis, 6-8 μ crassis, septatis, irregulariter ramosis compositum. Hyphopodia sat numerosa, alternantia v. unilateralia, breviter cylindracea, ovata v. subglobosa, 7-12.5 μ longa, 7-10 μ lata. Thyriothecia laxae v. dense dispersa, haud raro concentrice disposita, ambitu orbicularia vel plus minus angulata, 250-350 μ diam., rarius usque 400 μ , subinde confluentia; strato tegente leniter convexulo, in parte centrali opace atro, ad peripheriam tantum pellucide brunneo, ibique ex hyphis radiantibus, rectis v. subtortuosis, septatis, 3-5 μ crassis composito, in maturitate laciniis triangularibus stellatim dehiscente. Asci numerosi, 6-8-spori, late ellipsoidei v. ovati, sessiles, 60-75 \times 37.5-45 μ , firme et crasse tunicati. Sporae oblongae, brunneae, utrinque rotundatae, circa medium septatae, vix constrictae, dense et distincte verruculosae, 27.5-35 \times 14-17 μ , cellula inferiore plerumque leniter angustiore. Paraphyses numerosae, filiformes, septatae, 2-2.5 μ crassae.

Hab. in foliis *Syzygii Gerrardi*, in silvis, Woodbush, Transvaal, leg. Doidge, 17755.

Asterina Trichocladi Doidge nov. spec.

Plagulae epiphyllae, tenuissimae, griseo-atrae, plus minus orbiculares, laxae dispersae, usque 5 mm. diam., parum perspicuae. Mycelium tenue, laxae reticulatim ex hyphis pallide olivaceis, leniter undulatis, obscure septatis, 2.5-3.5 μ crassis compositum. Hyphopodia parce evoluta, solitaria, alternantia v. unilateralia, continua, semiglobosa, pulvinata, saepe plus minus depressa, cylindracea v. pyriformia, raro sublobata, 5-7.5 μ longa, 5-7 μ lata. Thyriothecia numerosa, sparsa, ambitu plus minus orbicularia, 250-380 μ diam.; membrana basali nulla; strato tegente ex hyphis radiantibus, sinuosis, 2.5-3.5 μ crassis, cellulis 5-7.5 μ longis composito, margine crenato haud fimbriato. Asci sat numerosi, 8-spori, oblongi v. subclavati, antice rotundati, postice subito in stipitem brevissimum contracti, 50-72.5 \times 17-18 μ . Sporae distichae v. conglobatae, oblongae, pellucide olivaceae, utrinque rotundatae, 1-septatae, leniter constrictae, leves, 13-18 \times 6-7 μ , cellulis subaequalibus v. superiore paullo latiore. Paraphysoidae numerosae, fibrosae, mox mucosae.

Hab. in foliis *Trichocladi criniti*, in silvis Knysna, leg. Bottomley, 32231.

Asterina Vepridis Doidge nov. spec.

Plagulae amphigenae, irregulariter sparsae, ambitu plus minus orbiculares, usque 3 mm. diam., tenues, griseo-atrae. Mycelium ex hyphis laxe reticulato-ramosis, rectiusculis, olivaceo-brunneis, 3·5–5 μ crassis compositum. Hyphopodia sat numerosa, opposita, alternantia v. unilaterialia, continua, pyriformia, recta v. leniter curvata, ad apicem attenuata, 7·5–11 μ longa, 4–5 μ lata. Thyriothecia numerosa, in centro plagularum dense dispersa, haud raro 2–4 vel plun conferta et onmino confluentia, singula 160–200 μ diam., ambitu plerumque orbicularia; membrana basali distincta nulla; strato tegente olivaceo-brunneo, convexulo, ex hyphis radiantibus, rectiusculis, 3–4 μ crassis, cellularum in parte centrali fere isodiametricatum, 3–5 μ longarum composito, in maturitate laciniis triangularibus stelatim dehiscente, periphice breviter fimbriato. Asci 8-spori, subglobosi vel ovati, sessiles, 50–52·5 \times 45–47·5 μ . Sporae conglobatae, oblongae, utrinque rotundatae, medio vel paullo infra medium septatae et constrictae, olivaceo-brunneae. leves, 25–29 μ longae, cellula superiore 15–16 μ longa et 14–15 μ lata, inferiore 11–14 μ longa et 11–12·5 μ lata.

Hab. in foliis *Vepridis lanceolatae*, in silvis Xumeni, prope Donnybrook, leg. Doidge, 2774.

Asterina Woodii Doidge nov. spec.

Plagulae amphigenae, irregulariter sparsae, atrae, tenues, ambitu irregulares, usque 6 mm. diam., subinde conflundo majores et saepe magnam folii partem occupantes. Mycelium ex hyphis remote ramosis et laxe reticulatis, pellucide brunneis, rectis v. leniter undulatis, 3–5 μ crassis compositum. Hyphopodia modice copiosa, opposita, alternantia v. unilaterialia, 2-cellularia, plus minus cylindracea sed uncinata v. varie curvata, raro sublobata, 10–17·5 μ longa et 3·5–5 μ lata, cellula inferiore cylindracea, 2·5–10 μ longa. Thyriothecia densiuscule sparsa vel 2–8 dense conferta, ambitu orbicularia v. e mutua pressione irregularia, 120–160 μ diam., primitus omnino clauso, deinde stellatim dehiscencia, tandem fere ad marginem aperta; membrana basali distincta, fumoso-griseola; strato tegente pellucide brunneo, ex hyphis radiantibus, rectiusculis, 2–3 μ crassis composito, periphice breviter fimbriato. Asci ovati v. subglobosi, 8-spori, 30–37·5 \times 22·5–27·5 μ , sessiles, in massa mucosa ochracea inclusi. Sporae conglobatae, oblongae, utrinque rotundatae, brunneae, circa medium valde constrictae, 22·5–25 \times 10–12·5 μ , cellulis ellipsoideis, superiore leniter latiore, in maturitate opace atro-brunneae et echinulis grossiusculis dense obsitis.

Hab. in foliis *Capparidis Guicinzii*, Natal, leg. Medley Wood, (Wood 6458a) 9524a.,

Asterina xumenensis Doidge nov. spec.

Plagulae amphigenae et caulicolae, tenues, parum perspicuae, irregulariter sparsae usque 1 mm. diam. Mycelium ex hyphis irregulariter laxeqe reticulato-ramosis, plus minus undulatis, 2·5–3·5 μ crassis, obscure septatis compositum. Hyphopodia sat numerosa, solitaria, unilaterialia v. alternantia, raro opposita, continua, rarissime 2-cellularia, quoad formam sat irregularia, plerumque 5–11 μ longa et 5–10 μ lata, plus minus 2–4-lobata, raro etiam subcylindracea, sinuosa. Thyriothecia sparsa v. aggregata, haud raro 2–3 vel plura dense conferta et omnino confluentia, singula ambitu plerumque orbicularia, 65–100 μ diam.; membrana basali distincta nulla; strato tegente convexulo, atro-brunneo, primitus clauso dein stellatim dehiscente, ex hyphid radiantibus 2–2·5 μ crassis, breviter articulatis composito, periphice fimbriato. Asci sat numerosa, ovati vel ovato-globosi, sessiles, 8-spori, 18–20 \times 11–16 μ . Sporae conglobatae, pellucide olivaceo-brunneae, leves, oblongae, 1-septatae, leniter constrictae, utrinque rotundatae, 11–12·5 \times 5–6 μ , postice paullo attenuatae. Pycnidia simul praesentia, 37·5–50 μ diam. Conidia oblonga, ellipsoidea v. subclavata, olivaceo-brunnea, zonula hyalina praedita, 10–15 \times 4–6 μ .

Hab. in foliis caulisque *Lobeliae stellarioidis*, in silvis, Xumeni, prope Donnybrook, leg. Morgan et Doidge, 30483.

Asterina Zeyheri Doidge nov. spec.

Plagulae epiphyllae, atrae, plus minus orbiculares, usque 5 mm. diam. Mycelium ex hyphis radiantibus, rectiusculis v. leniter undulatis, olivaceo-brunneis, 5–6 μ crassis, irregulariter ramosis et anastomosantibus compositum. Hyphopodia sat numerosa, unilaterialia v. alternantia, breviter cylindracea v. ovata, 7·5–15 μ longa et 7·5–9 μ lata. Thyriothecia plus minus dense disposita, ambitu orbicularia, 250–350 μ diam., subinde

confluentia; strato tegente convexulo, in parte centrali opace atro-brunneae, ex hyphis radiantibus, tortuosis, ad marginem latum pellucidum $3-5\mu$ crassis composito, primitus omnino clauso, in maturitate irregulariter stellatim dehiscente. Asci numerosi ovati vel late ellipsoidei, sessiles, 8-sporei, $67.5-80 \times 40-45\mu$, firme crasseque tunicati. Sporae conglobatae, oblongae, utrinque late rotundatae, 1-septatae, valde constrictae, olivaceo-brunneae, leves, $30-39\mu$ longae, cellula superiore $15-20\mu$ longa et $14-16\mu$ lata, inferiore $14-19\mu$ longa et $12.5-15\mu$ lata. Paraphyses numerosae, hyalinae, filiformes, ascos superantes, ca. 1μ crassae.

Hab. in foliis *Eugeniae Zeyheri*, in silvis, Alexandria, leg. Doidge, 22357.

Asterinella Tecleae Doidge nov. spec.

Plagulae hypophyllae, sparsae, griseo-atrae, haud acute definatae. Mycelium tenue, ex hyphis reticulato-ramosis, pellucide olivaceo-brunneis, obscure septatis, plerumque $2-2.5\mu$ crassis compositum; hyphopodia nulla. Thyriothecia sparsa v. rarius $2-4$ conferta et confluentia, ambitu orbicularia, $200-220\mu$ diam.; strato tegente leniter convexulo, ex hyphis radiantibus, pellucide olivaceo-brunneis, $2-3\mu$ crassis, cellularum in parte centrali $4-6\mu$ longis, marginem versus elongatarum et usque 10μ longarum composito, in maturitate laciniis triangular, bus stellatim dehiscente, periphice breviter fimbriato. Asci sat numerosi (usque 20), 8-sporei, subglobosi v. ovati, sessiles, $22-37.5 \times 25\mu$, firme tunicati. Sporae conglobatae, subclavatae, 1-septatae, haud vel leniter constrictae, antice rotundatae, postice plerumque attenuatae, $20-26.5\mu$ longae, cellula superiore ovata, $11-14\mu$ longa et $7.5-10\mu$ lata, inferiore plus minus cuneata, $9-12.5\mu$ longa et ad septum $6-8\mu$ lata. Pycnidia numerosa, thyriothecii similia. Conidia hyalina, cylindracea, recta v. leniter curvata, utrinque obtusa, 7-septatae, $45-50\mu$ longa, $3.5-5\mu$ lata.

Hab. in foliis *Tecleae natalensis*, in silvis, Heanertsburg, leg. Doidge, 17783.

Asterolibertia megathyria var. *Randiae* Doidge nov. var.

Mycelium ex hyphis $3-4\mu$ crassis, nodis $5-8\mu$ diam., compositum. Thyriothecia $75-100\mu$ diam. Asci 4-sporei, ovati v. subclavati, $22-28 \times 12-15\mu$. Sporae oblongae, $15-18\mu$ longae, cellula superiore $5-7.5\mu$ longa et $5-6.5\mu$ lata, inferiore $9-11\mu$ longa et 5μ lata. Alioque typo similis.

Hab. in foliis *Randiae dumetorum*, Lemana, Transvaal, leg. Doidge, 1792.

Asterostomella eugenicola Doidge nov. spec.

Plagulae amphigenae, atrae, irregulariter dispersae, primitus plus minus orbiculares usque 4 mm. diam., dein saepe confluentes majores. Mycelium reticulato-ramosum, ex hyphis rectiusculis, pellucide olivaceo-brunneis, $4-5\mu$ crassis, cellulis, $20-30\mu$ longis compositum. Hyphopodia modice copiosa, alternantia v. unilaterialia, raro opposita, bicellularia, recta v. curvata, $12-20\mu$ longa; cellula basali breviter cylindracea, plerumque $4-6\mu$, interdum usque 10μ longa, ca. 5μ lata, apicali cylindricae v. ovata, rarius truncata, sublobata v. irregularia, $7.5-11.5\mu$ longa, plerumque $5-6\mu$ lata, interdum usque 9μ lata. Pycnidia numerosa, equaliter densiusculeque dispersa, ambitu plerumque orbicularia, $75-120\mu$ diam.; strato tegente leniter convexo, ex hyphis radiantibus, rectis, crebre septatis, in parte centrali $2.5-4\mu$ longis et latis, peripheriam versus leniter elongatis usque 6μ longis, pellucide atro-brunneis composito, margine breviter fimbriato. Conidia sat numerosa, ovata v. ovato-oblonga, continua, brunnea, centro zonula subhyalina praedita, $15-21.5 \times 7.5-10\mu$.

Hab. in foliis *Eugeniae natalitiae*, Hogsback, leg. J. et M. Henderson, 11340.

Asterostomella Visci Doidge nov. spec.

Plagulae amphigenae, tenues, plus minus orbiculares v. irregulares, non vel vix determinatae, confluentes, atrae. Mycelium reticulato-ramosum, ex hyphis rectiusculis vel plus minus undulatis, brunneis, septatis, $5-6\mu$ crassis, cellulis $10-17.5\mu$ longis compositum. Hyphopodia sat numerosa, unilaterialia v. alternantia, continua, plerumque subglobosa, rarius breviter cylindracea v. sublobata, $8-12\mu$ longa, $7-9\mu$ lata. Pycnidia numerosa, densiuscule dispersa, ambitu orbicularia, saepe confluentia, $50-120\mu$ diam.; strato tegente leniter convexo, pellucide brunneo, ex hyphis radiantibus $4-6\mu$ crassis, crebre septatis, articulis $4-5\mu$ longis composito, margine haud fimbriato. Conidia sat numerosa, continua, brunnea, centro semper zonula subhyalina plus minus distincta praedita, ovata, oblonga v. late ellipsoidea, $15-21 \times 10-12.5\mu$.

Hab. in foliis *Visci obscuri*, Assegai Bush, leg. Doidge, 17237.

***Calopeltis Jasmini* Doidge nov. spec.**

Mycelium liberum nullum. Thyriothecia semper epiphylla, ambitu plus minus orbicularia vel angulata, 100–150 μ diam., crustas superficiales 2–2.5 mm. diam., atras, orbiculares, sparsas formantia, minora et juniora saepe circulo crustas circumdantia, sine maculis; strato tegente e membranis singulis thyriotheciorum constante; membranae singulae convexae, ex hyphis radiantibus plus minus maeandrice curvatis compositae, centro dilutiores ibique pellucide olivaceo-brunneae radiatim e cellulis 2–3 μ longis, 2–2.5 μ latis, tenuiter tunicatis compositae, primitus clausae, tandem poro irregulari 15–20 μ lato apertae; contextu membranae singulae peripheriam versus e cellulis atro-brunneis usque 15 μ longis composito. Asci clavati v. ellipsoidei ad apicem late rotundatum leniter uncrassati, basim versus attenuati, sessiles, firme tunicati, 8-spori, 40–50 \times 12.5–15 μ . Sporae plus minus distichae, oblongo-clavatae, ad apicem late rotundatae, basim versus sensim attenuatae, 1-septatae, haud vel vix constrictae, 12.5–16 μ longae, cellula superiore 4–5 μ longa et 4.5–5 μ lata, inferiore 7.5–10 μ longa, ad septum 3.75–4.5 μ lata. Paraphysoidae parce evolutae, fibrosae.

Hab. in foliis *Jasmini streptopi*, Durban, leg. Medley Wood, 9516.

***Ferrarisia Jasmini* Doidge nov. spec.**

Mycelium liberum nullum. Thyriothecia amphigena, plerumque epiphylla, sparsa vel greges plus minus orbiculares, saepe confluentes, usque 7 mm. diam. metientes, atos formantia; singula vel saepe dense stipata et connexa, ambitu orbicularia subinde obtuse angulata v. irregularia, 120–200 μ diam.; strato tegente convexulo, ex hyphis opace atrobrunneis, radiantibus, plus minus sinuosis, 4 μ crassis, breviter articulatis (articulis 5–8 μ longis) composito, ad peripheriam irregulari vel breviter fimbriato, omnino clauso, in maturitate lacinii ca. 3–5, triangularibus ad marginem disrumpente. Asci pauci, late ellipsoidei v. ovati, 8-spori, firme tunicati, ad apicem late rotundati et leniter incrassati, 35–40 \times 25–35 μ . Sporae conglobatae v. indistincte tristichae, oblongae, utrinque rotundatae, 1-septatae, constrictae, brunneae, leves, 22–25 μ longae, cellula superiore 12.5–14 μ longa et 10–11.5 μ lata, inferiore 10–11.5 μ longa et 7.5–10 μ lata. Paraphysoidae indistincte fibrosae, mox mucosae.

Hab. in foliis *Jasmini angularis*, Kentani, leg. Pegler, 2288.

***Lembosia Wageri* Doidge nov. spec.**

Plagulae epiphyllae, atrae, per totam folii superficiem laxae vel densiuscule et sat equaliter distributae, haud raro confluentes et magnam folii partem occupantes, ambitu irregularos, usque ca. 3 mm. diam., haud acute definitae. Mycelium ex hyphis plus minus undulatis, dilute olivaceo-brunneis, indistincte septatis, 2.5–4 μ crassis compositum. Hyphopodia parce evoluta, solitaria, continua vel 2-cellularia, valde irregularia, plerumque plus minus lobata, 6–10 μ longa, 5–8 μ lata. Thyriothecia plerumque dense dispersa, haud raro plura dense conferta et plus minus connata, oblonga, recta v. curvata, 200–300 μ longa et 80–120 μ lata, rima longitudinali dehiscencia, vel orbicularia, 120–150 μ diam., stellatim dehiscencia; strato basali tenui, subhyalino; strato tegente convexulo, pellucide brunneo, ex hyphis radiantibus 2–3 μ crassis, cellulis 4–6 μ longis composito, periphice plus minus fimbriato. Asci numerosi, ovato-globosi vel ovati, sessiles, 6–8-spori, firme crasseque tunicati, 23–30 \times 16–20 μ . Sporae conglobatae, clavato-oblongae, antice rotundatae, postice leniter attenuatae, 1-septatae, haud vel vix constrictae, leves, dilute olivaceo-brunneae 15–17 μ longae, cellula superiore subglobosa, 6–6.25 μ longa, 5.5–6.25 μ lata, inferiore 8.75–11 μ longa, ad septum ca. 5 μ lata.

Hab. in foliis *Teclea natalensis*, Umhlanga Rocks, Natal, leg. V. A. Wager, 32472.

***Lembosina Rawsoniae* Doidge nov. spec.**

Mycelium liberum absens. Thyriothecia hypophylla, irregulariter et laxae vel densiuscule dispersa, subinde 2–4 densius disposita tunc praecipue in formam Y, L vel X connexa, oblonga vel linearia, utrinque leniter sed distincte attenuata, obesa, 200–450 μ longa, plerumque 250–300 μ longa, 80–100 μ lata, recta vel leniter curvata; membrana basali subhyalina sine structura distincta; strato tegente leniter convexulo, opace atro-brunneo, ex hyphis radiantibus, leniter undulatis 1–1.5 μ crassis, breviuscule articulatis, peripheriam versus pellucide olivaceo-brunneis composito, periphice haud fimbriato, in maturitate rima longitudinali dehiscencia. Asci copiosi, ovati v. clavato-oblongi, antice late rotundati, sessiles v. subsessiles, 8-spori, ca. 15–20 \times 7–10 μ . Sporae subdistichae v. conglobatae,

oblongae v. subclavatae, utrinque obtusae, antice laet rotundatae, postice leniter attenuatae, 1-septatae, haud vel vix constrictae, ex hyalino pellucide olivaceo-brunneae, leves, $7-10 \times 2.5-3 \mu$. Paraphysoidae fibrosae, sat persistentes.

Hab. in foliis *Rawsoniae lucidae*, in silvis, Eshowe, leg. Gerstner, 32662.

EXPLANATION OF PLATES.

In most of the plates the same method has been followed; in the upper half there is a low power drawing of part of a colony to show as far as possible the general habit of the fungus. ($\times ca 150$). Below there are detailed drawings of part of the covering membrane of the thyriothecium, hyphae, hyphopodia, ascospores and conidia when the latter are present ($\times 460$).

In Plates II, III, LXV and LXXI there is no low power drawing, all $\times 460$. Plate LXVI consists of drawings of sections through leaves of *Eucalyptus* spp. infected with *Lembosiosis eucalyptina* ($\times 460$). For further explanation see text.

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Mimusops obovata.....	317	Santalaceae.....	332
Morenoella Mollinediae.....	275	Sapindaceae.....	332
<i>Oxyanthae</i>	328		

Sapotaceae.....	332	Tiliaceae.....	332
Schneeplia radiata.....	328	Thyrinula eucalyptina.....	275
Sclerochiton harveyanus.....	300	Trema bracteolata.....	327
Scolopia Mundtii.....	277, 298, 300	Tricalysia lanceolata.....	315
Zeyheri.....	300	Sonderiana.....	316
Zeyheri var. spinosa.....	300	Trichasterina Popowiae.....	279
Secamone alpina.....	287	Styracis.....	276
Seynesia Balansae var. africana.....	305	Trichilia Dregeana.....	294
microthyrioides.....	305	emetica.....	294
nobilis.....	276	Trichocladus crinitus.....	294
orbiculata.....	329	ellipticus.....	320
Sida cordifolia.....	306	Trichomanes pyxidifera.....	329
Hislopil.....	295	Trimeria alnifolia.....	292, 293
rhombifolia.....	306	grandifolia.....	293
Sideroxylon inerme.....	289	trinervis.....	293
Sphaeria caffra.....	328	Tylophora Flanaganii.....	309
Sponia guineensis.....	327	Ulmaceae.....	332
Steganopycnis oncospermatis.....	276	Urticaceae.....	332
Streptocarpus.....	297	Vepris lanceolata.....	290
Streptocarpus Rexii.....	297	Viola abyssinica.....	296
Syzygium Gerrardi.....	282, 285	Violaceae.....	332
Tarenna pavettoides.....	316	Viscum obscurum.....	331
Teclea natalensis.....	316, 321	Xylothea Kraussiana.....	310
Thunbergia.....	301		

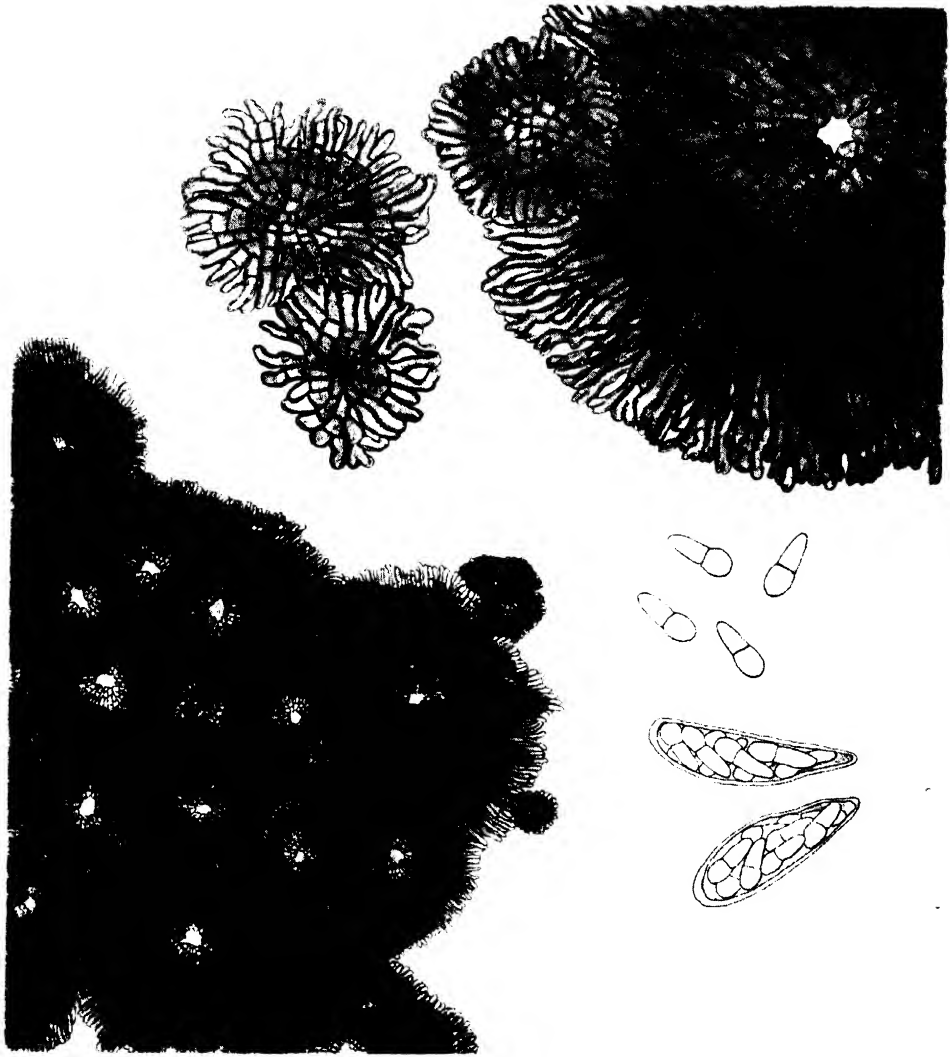


PLATE I.
Calopeltis Jasmini.

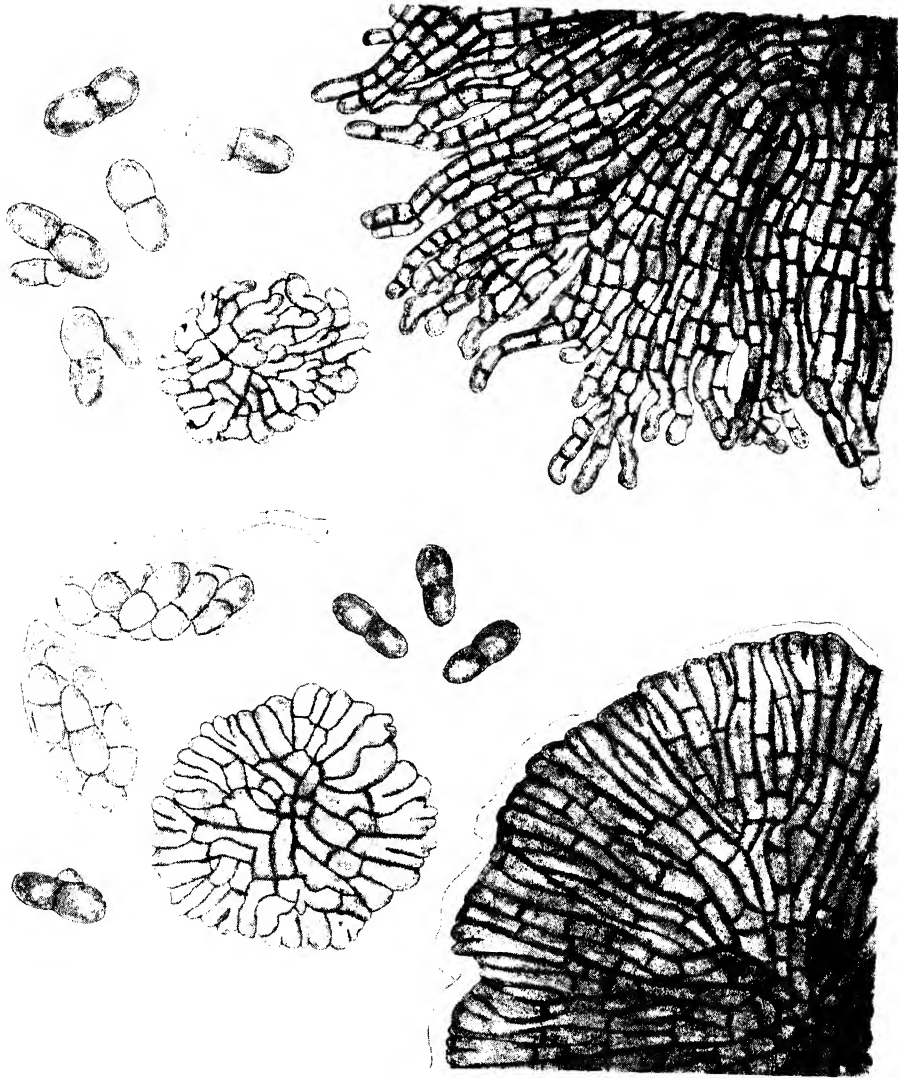


PLATE II.

Above (a) *Microthyrium ranulisporum*.
 Below (b) *Microthyrium maculicolum*.

and III have been reversed.

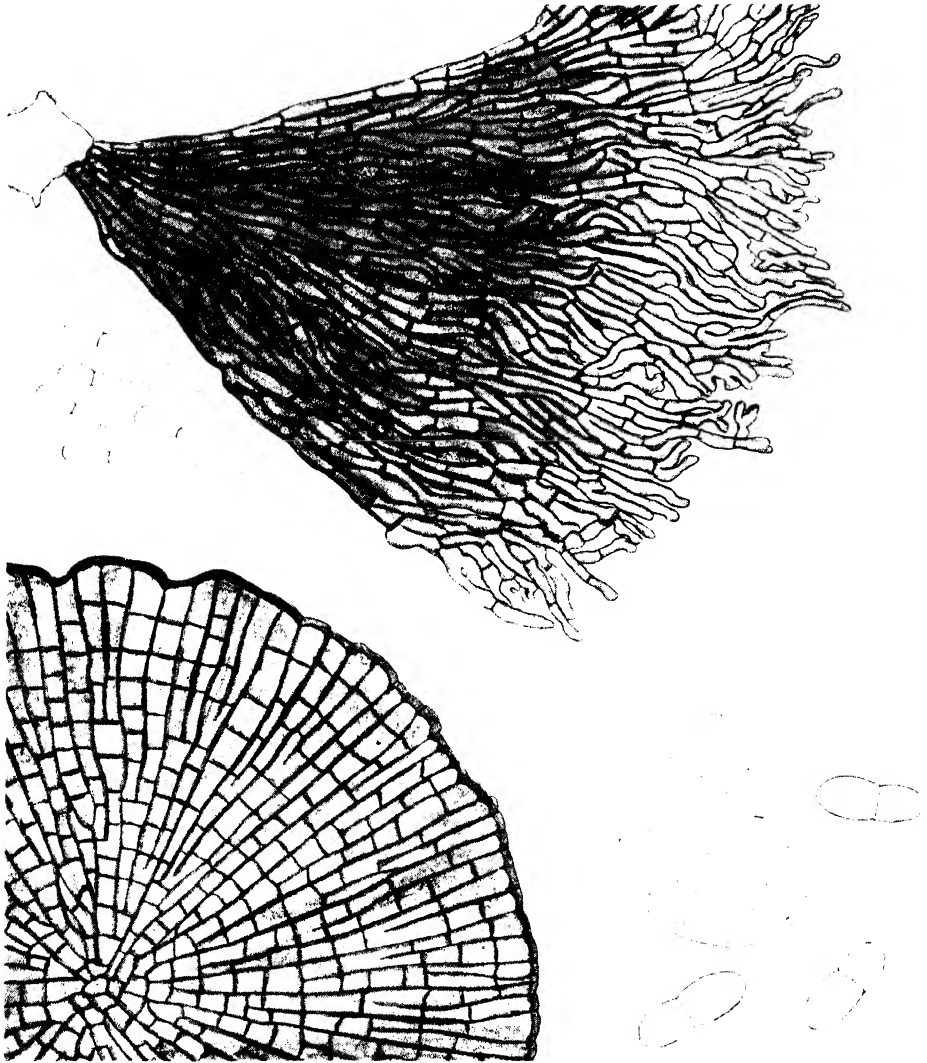


PLATE III.

Above (a) *Ferrarisia Jasmini*.Below (b) *Palauraniella orbiculata-Scymesia orbiculata*.

Plates II and III have been reversed

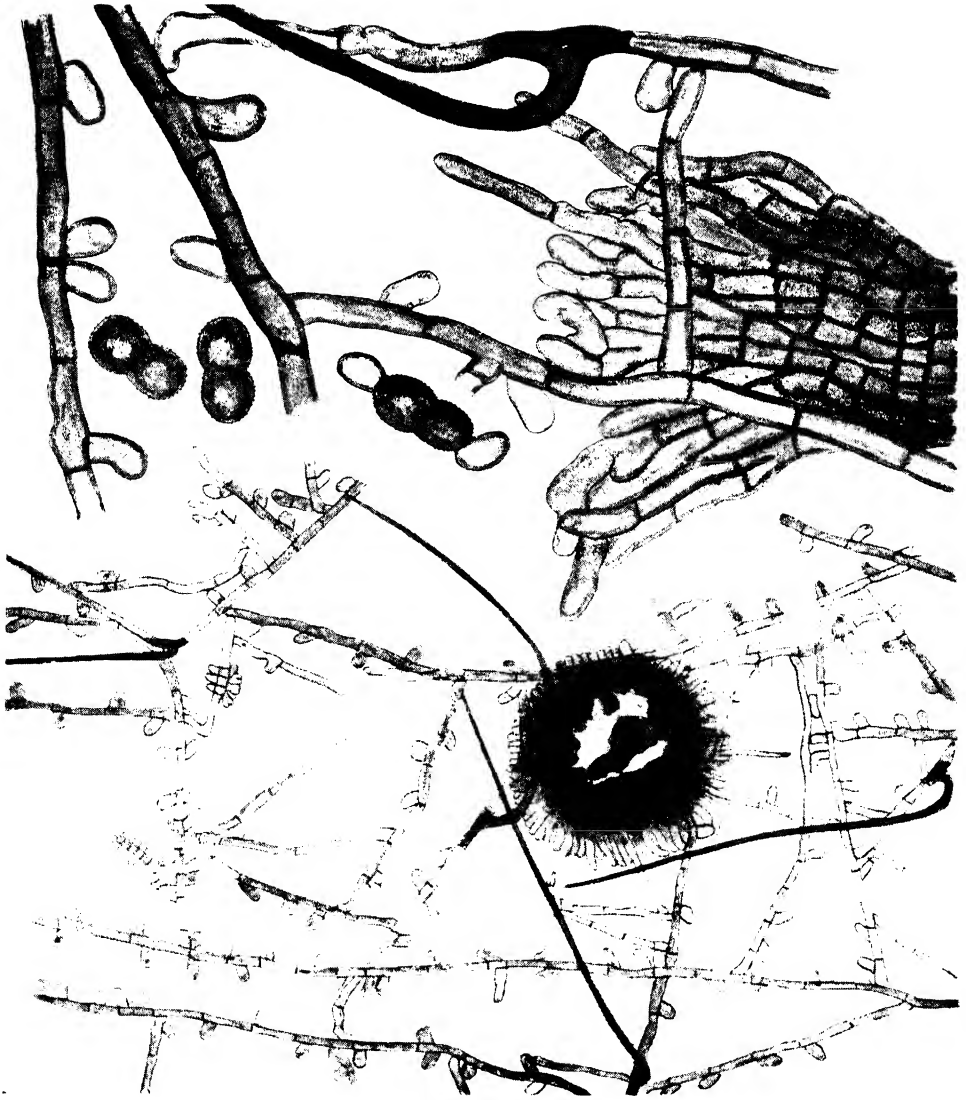


PLATE IV.
Trichasterina Popowiae.



PLATE V.
Asterina pemphodioides.

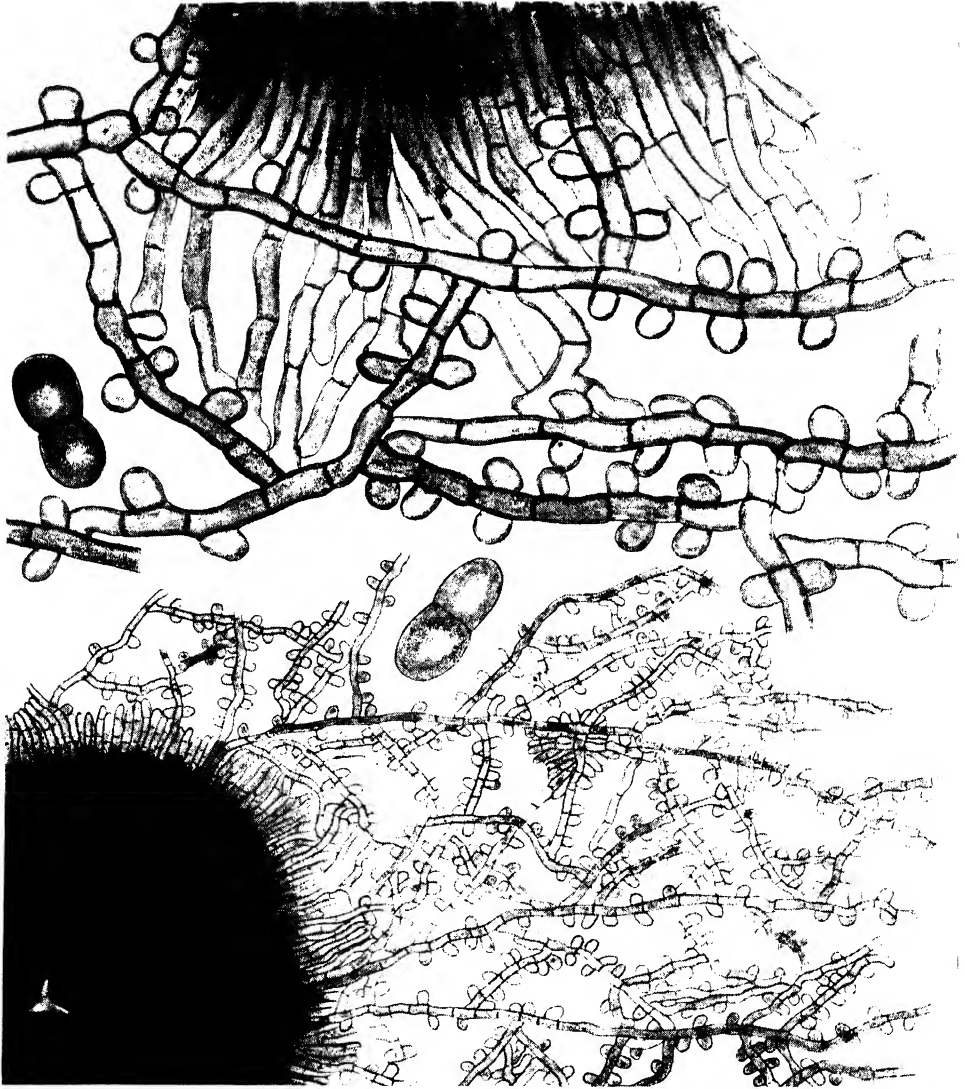


PLATE VI.
Asterina Oncinotidis.

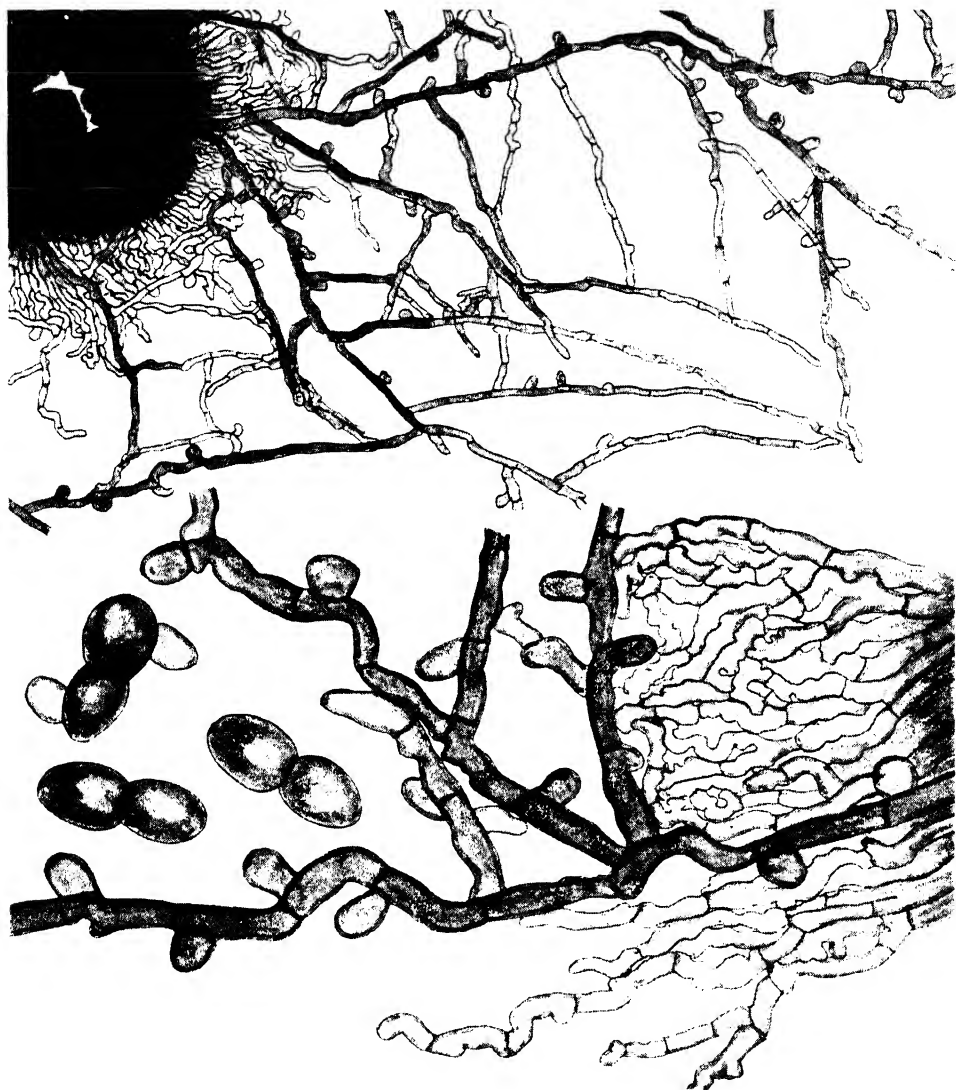


PLATE VII.
Asterina Zeyheri.

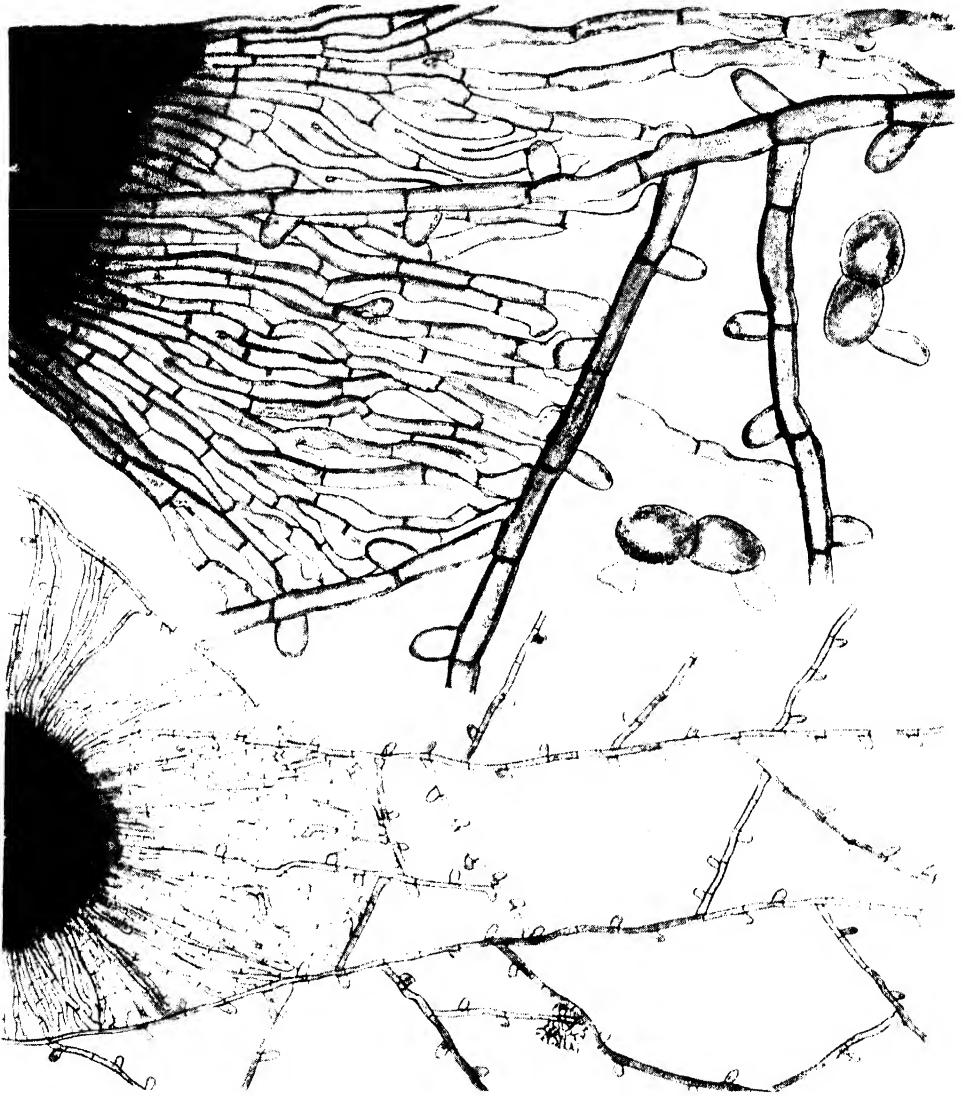


PLATE VIII.
Asterina natalitia.

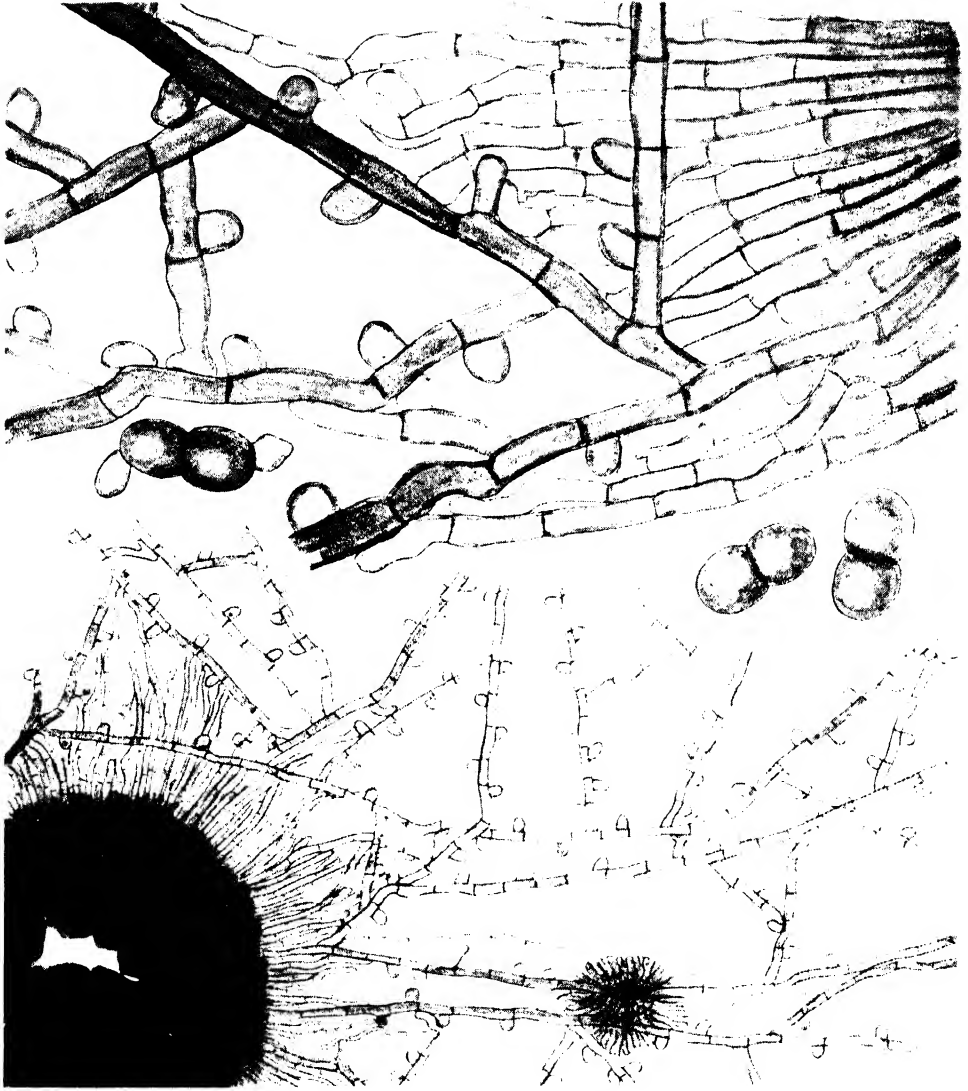


PLATE IX.
Asterina Oryanthae.

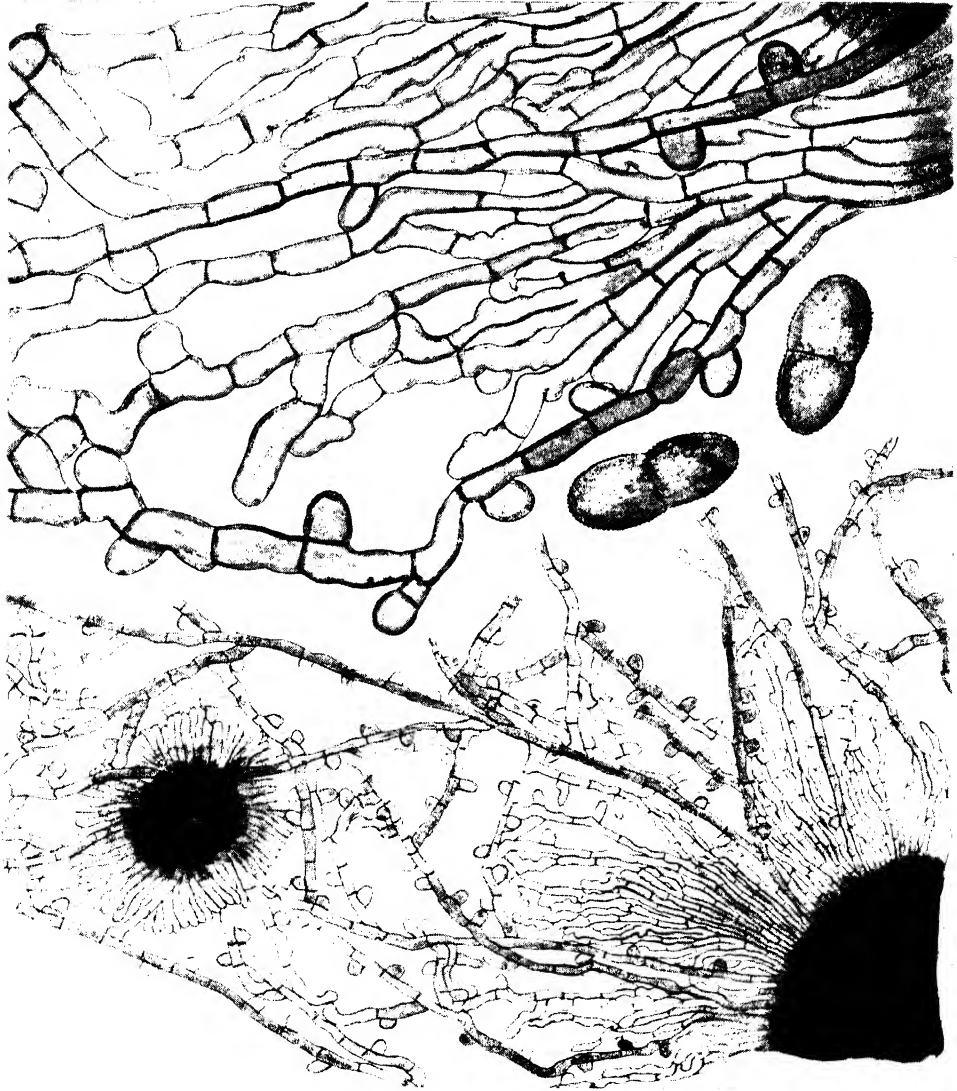


PLATE X.
Asterina Zyzgii.

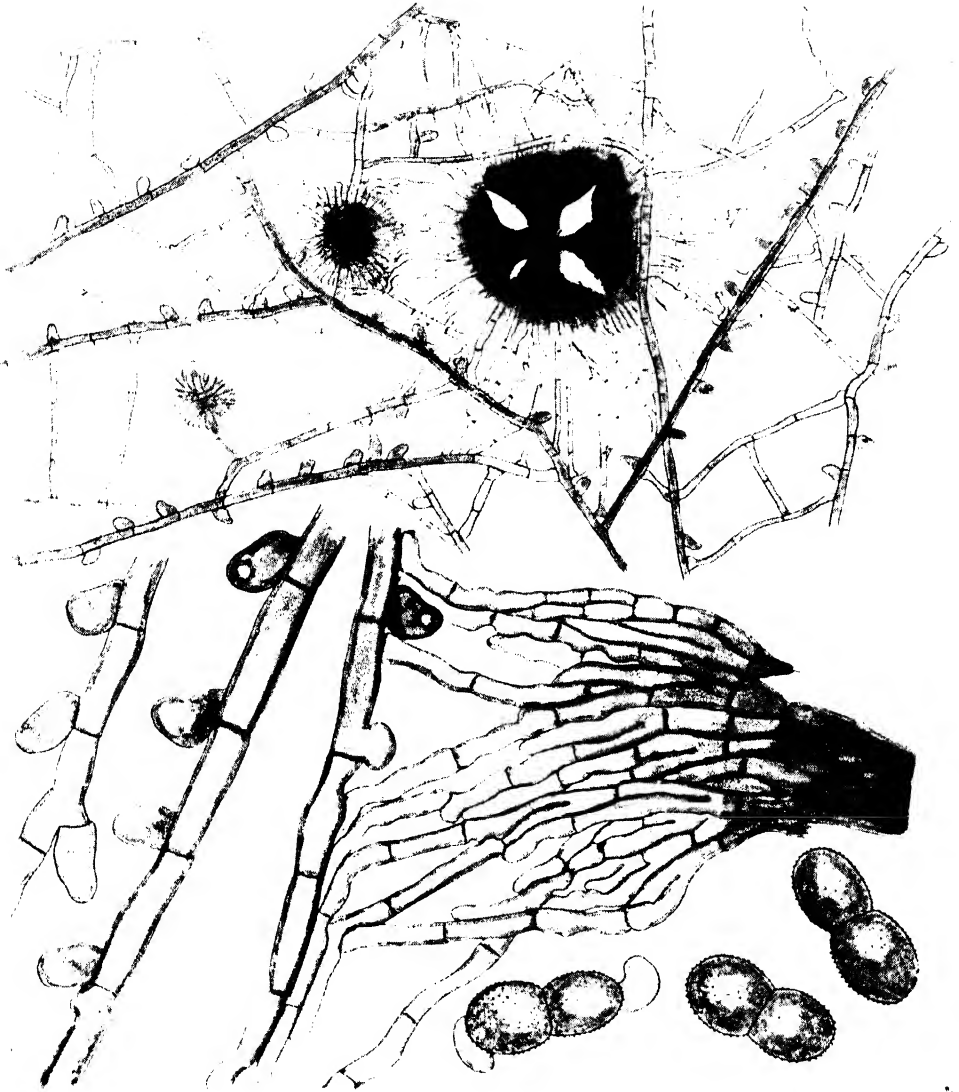


PLATE XL.
Asterina Knysnae.



PLATE XII.
Asterina nodosa.

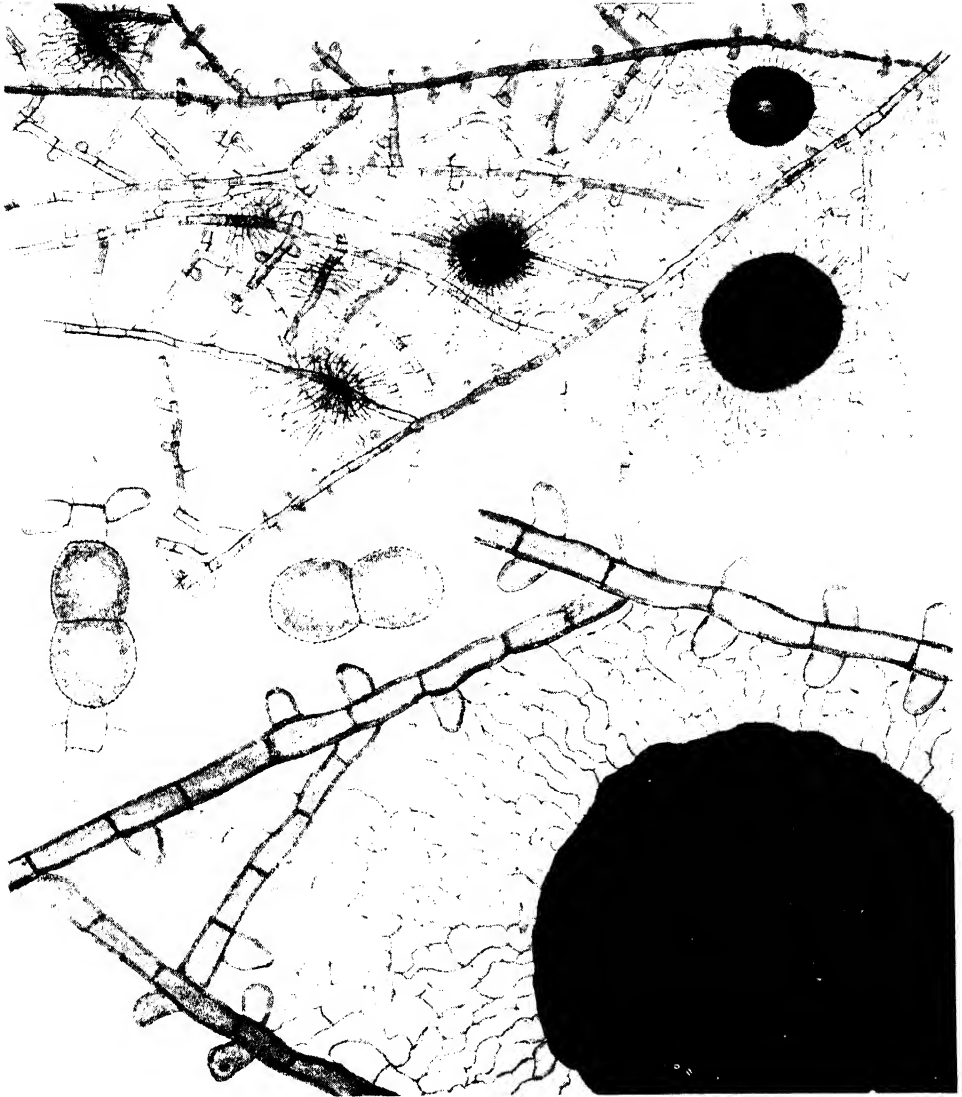


PLATE XIII.
Asterina Bottomleyae.

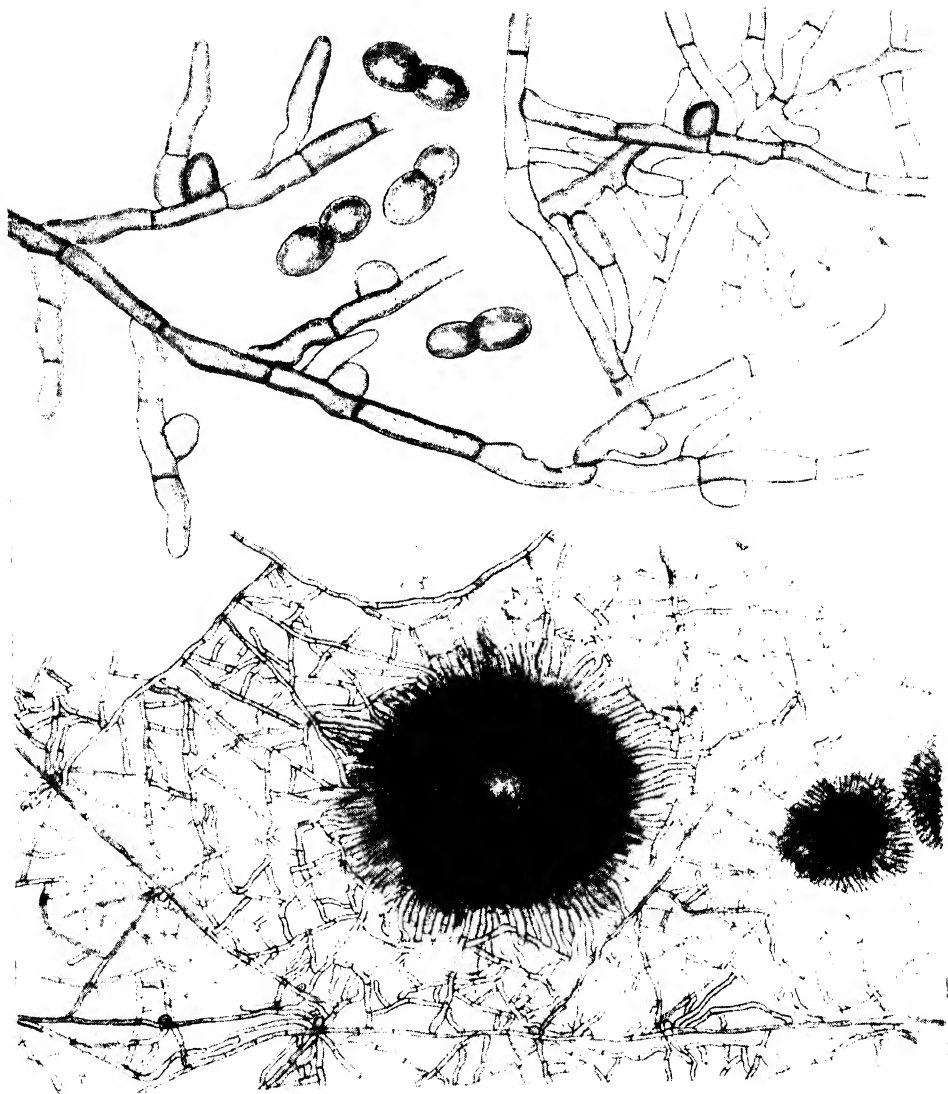


PLATE XIV.
Asterina secamonicola.



PLATE XV.
Asterina inconspicua.

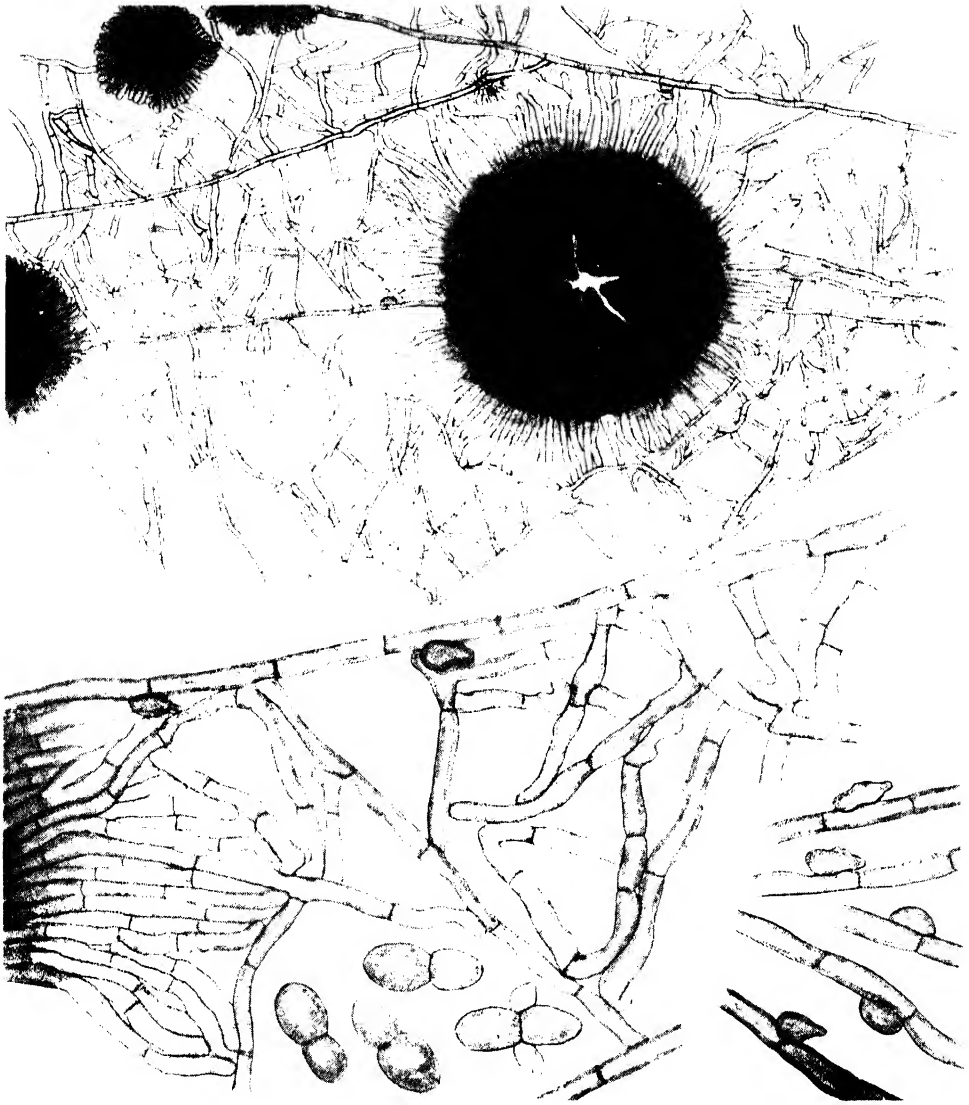


PLATE XVI.
Asterina dissiliens.

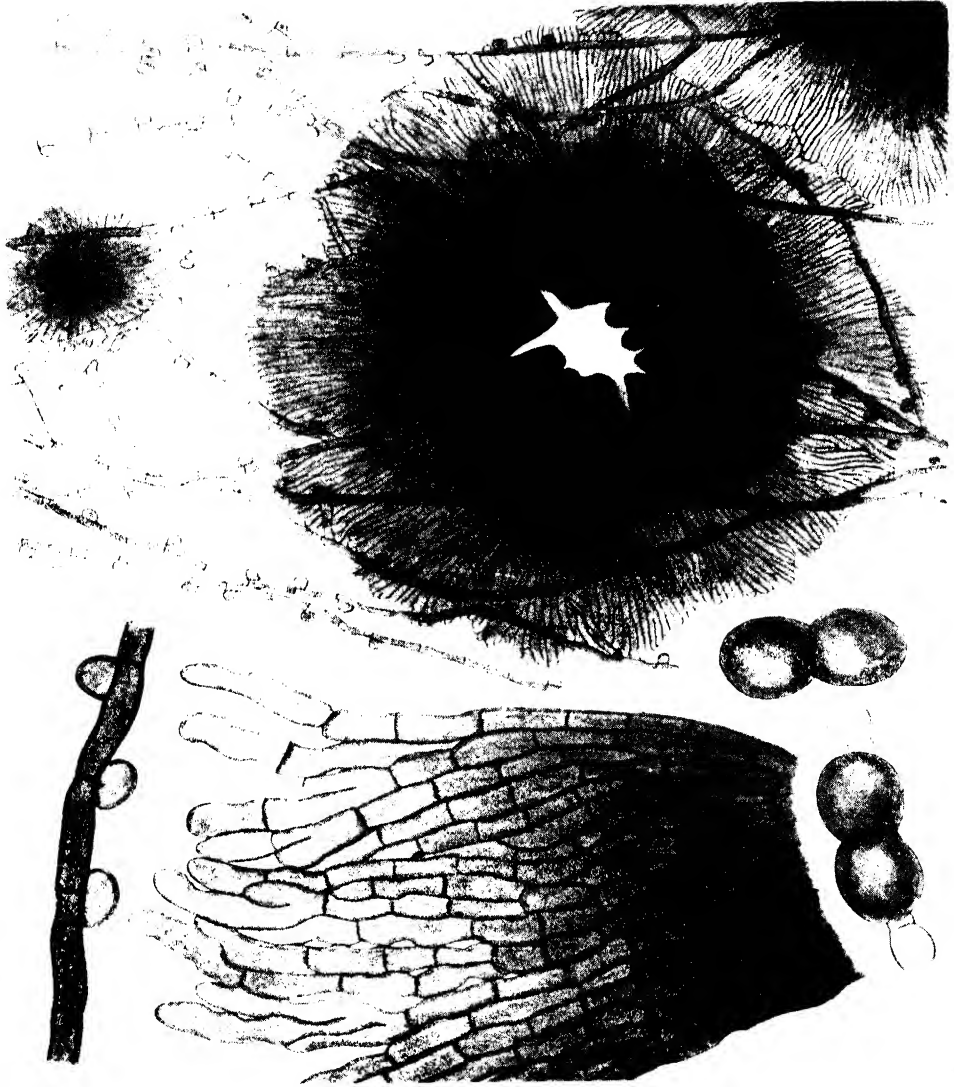


PLATE XVII.
Asterina robusta.

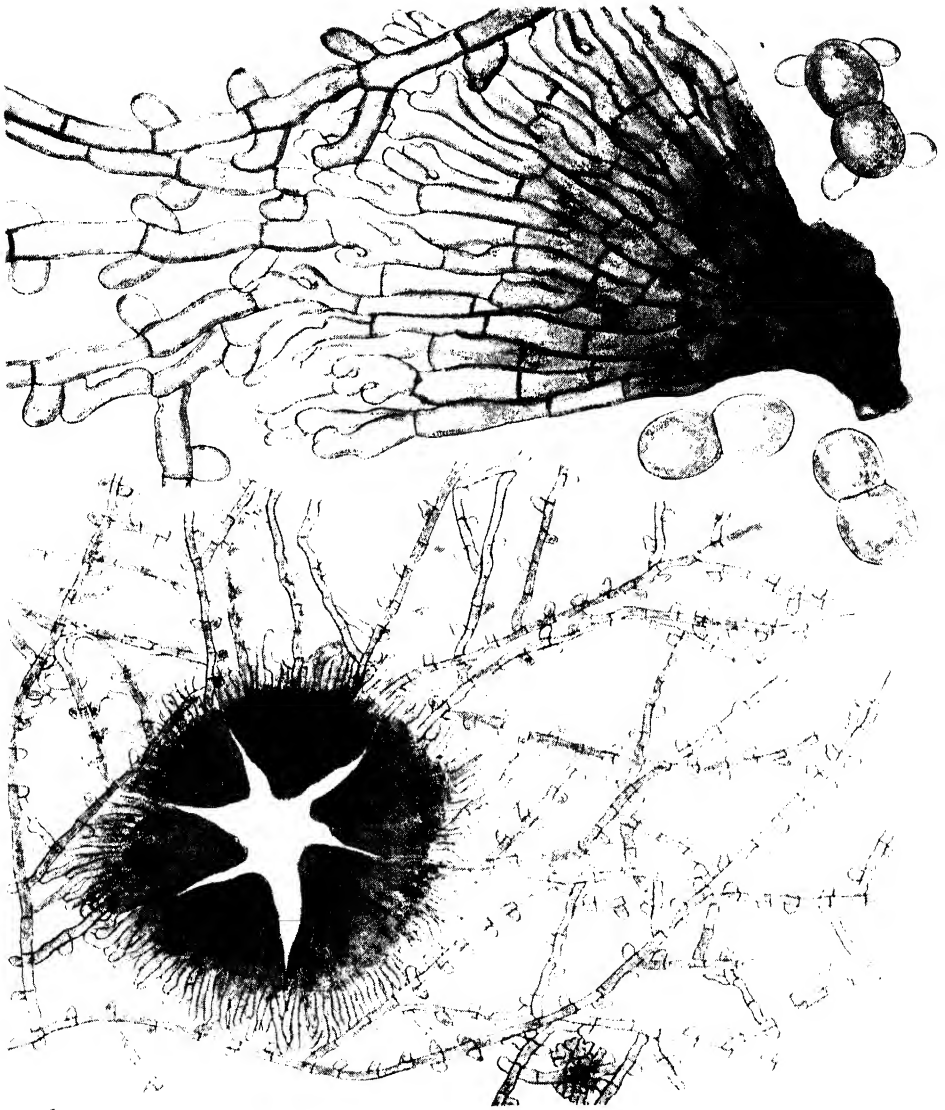


PLATE XVIII.
Asterina opaca.

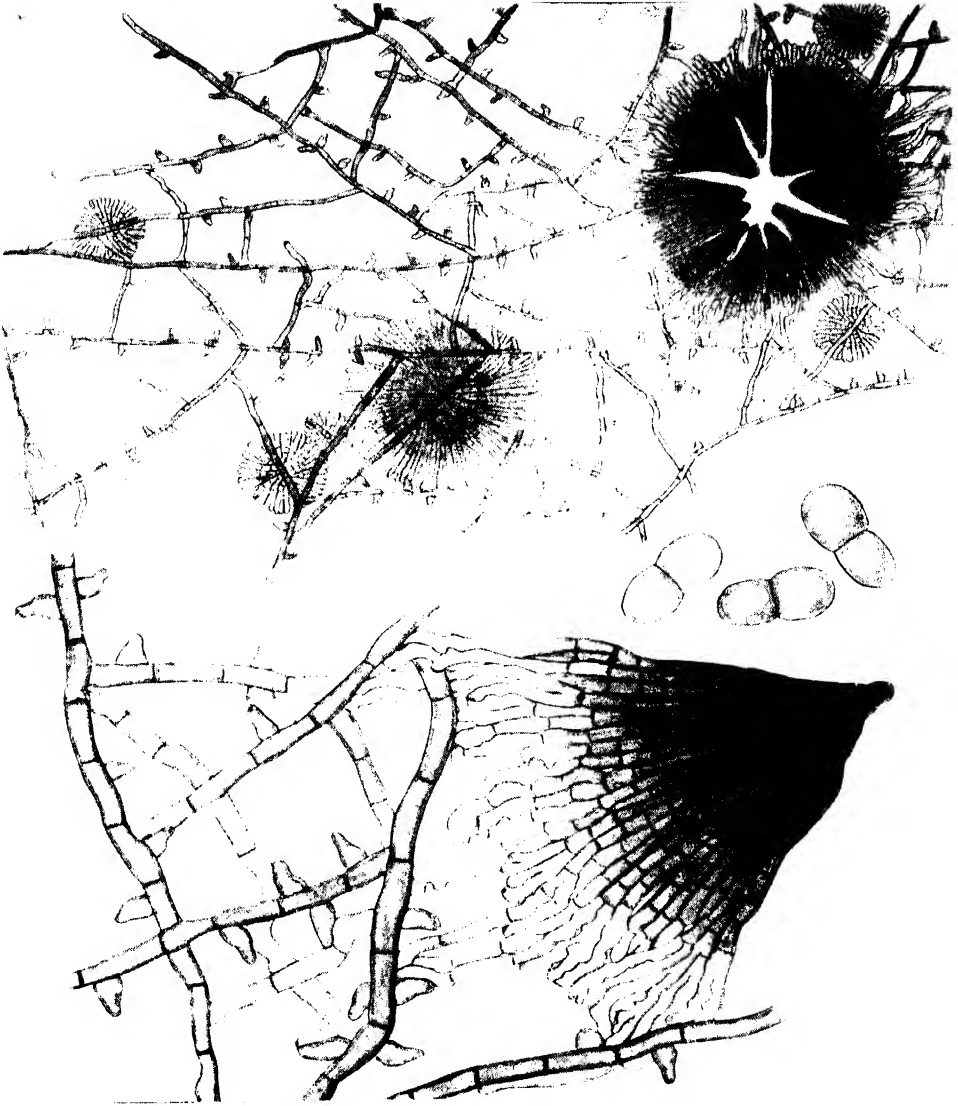


PLATE XIX.
Asterina Vepridis.

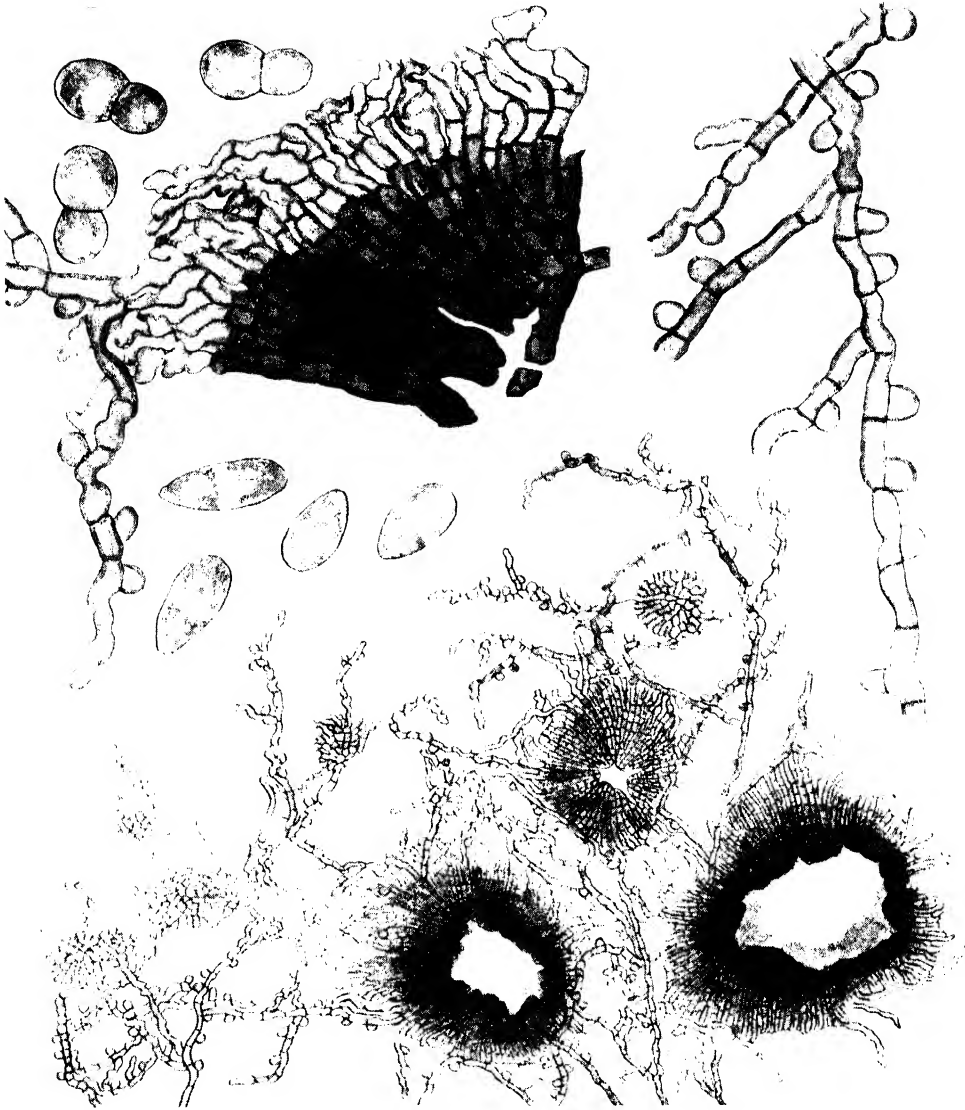


PLATE XX.
Asterina Hendersoni.

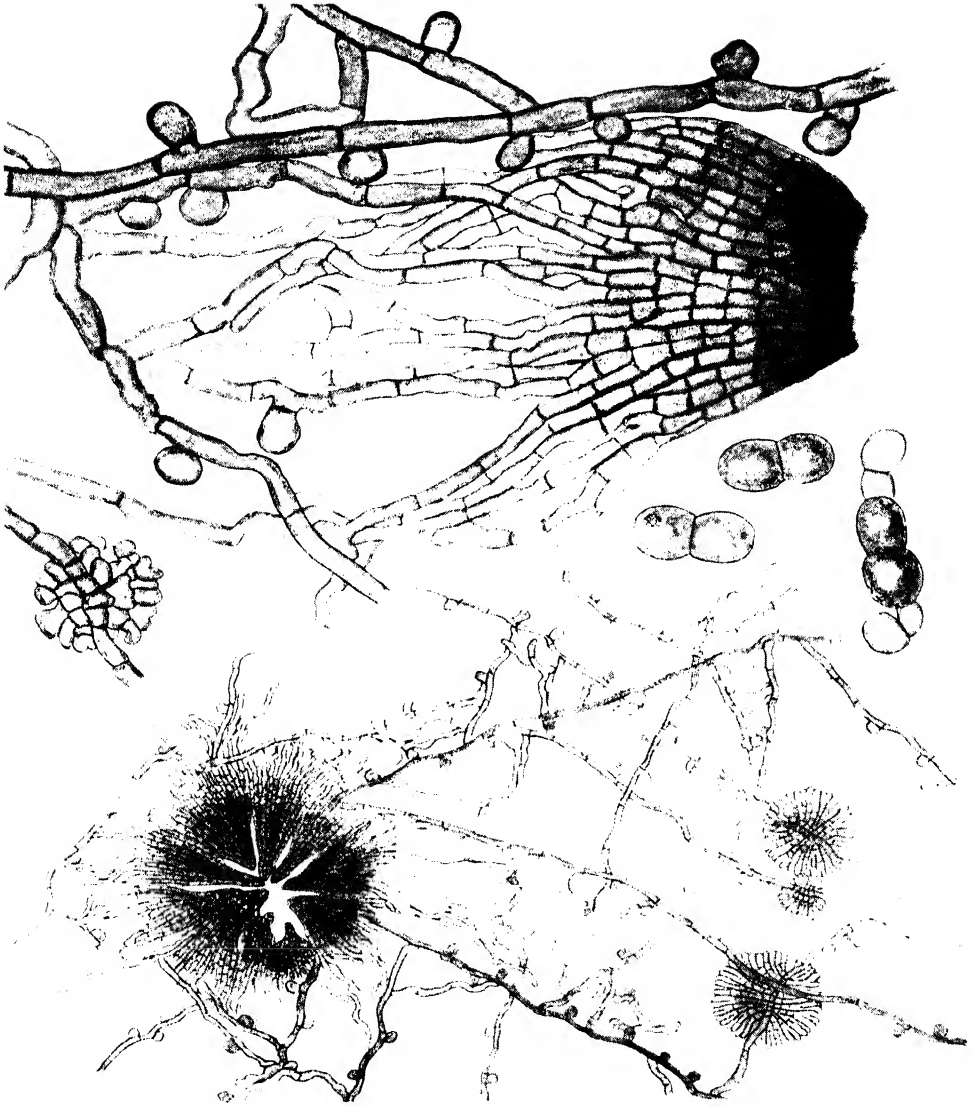


PLATE XXI.
Aslerma ferruginea.

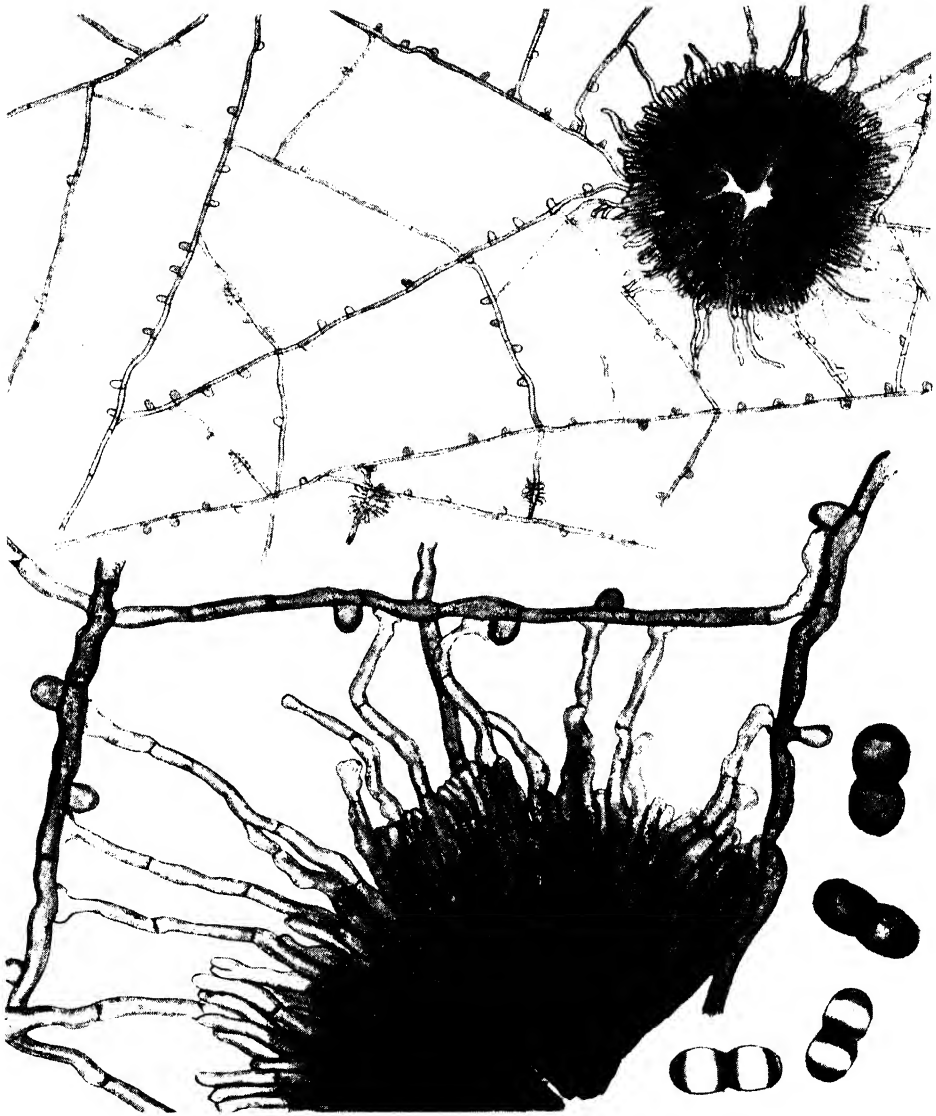


PLATE XXII.
Asterina Bosmanae.

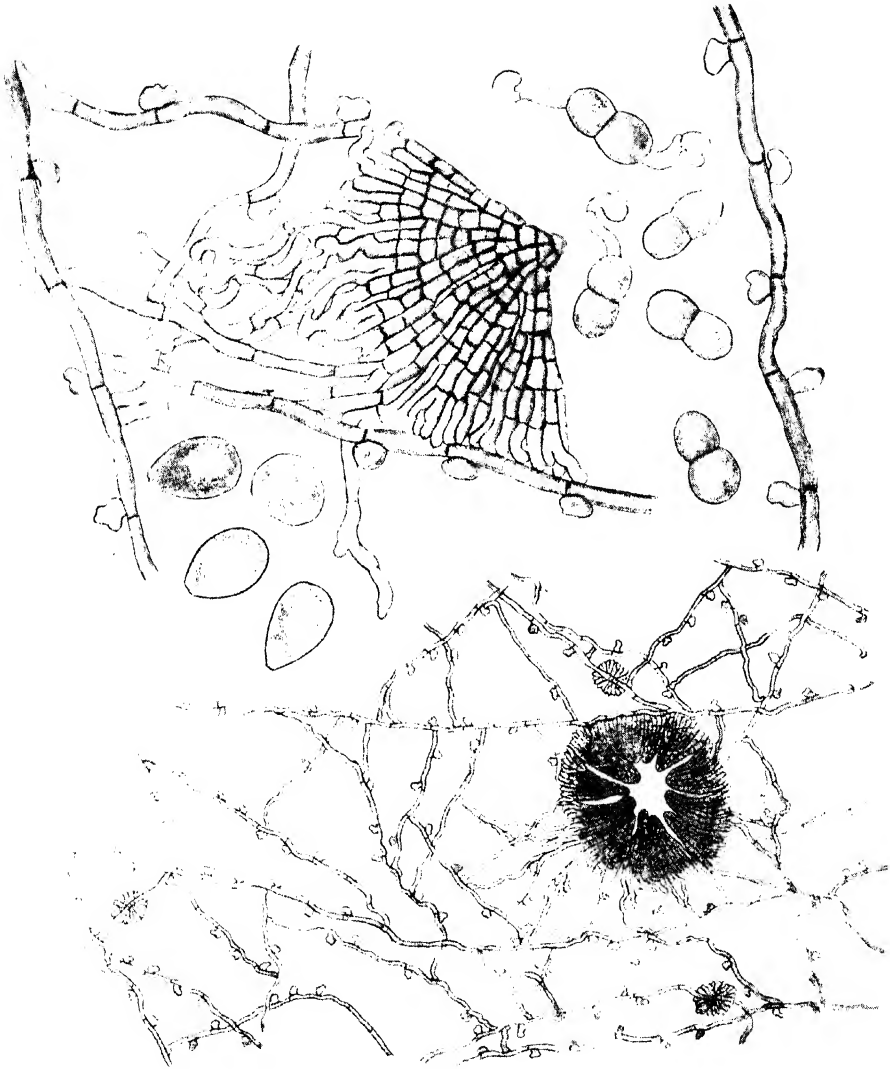


PLATE XXIII.
Asterina delicata.

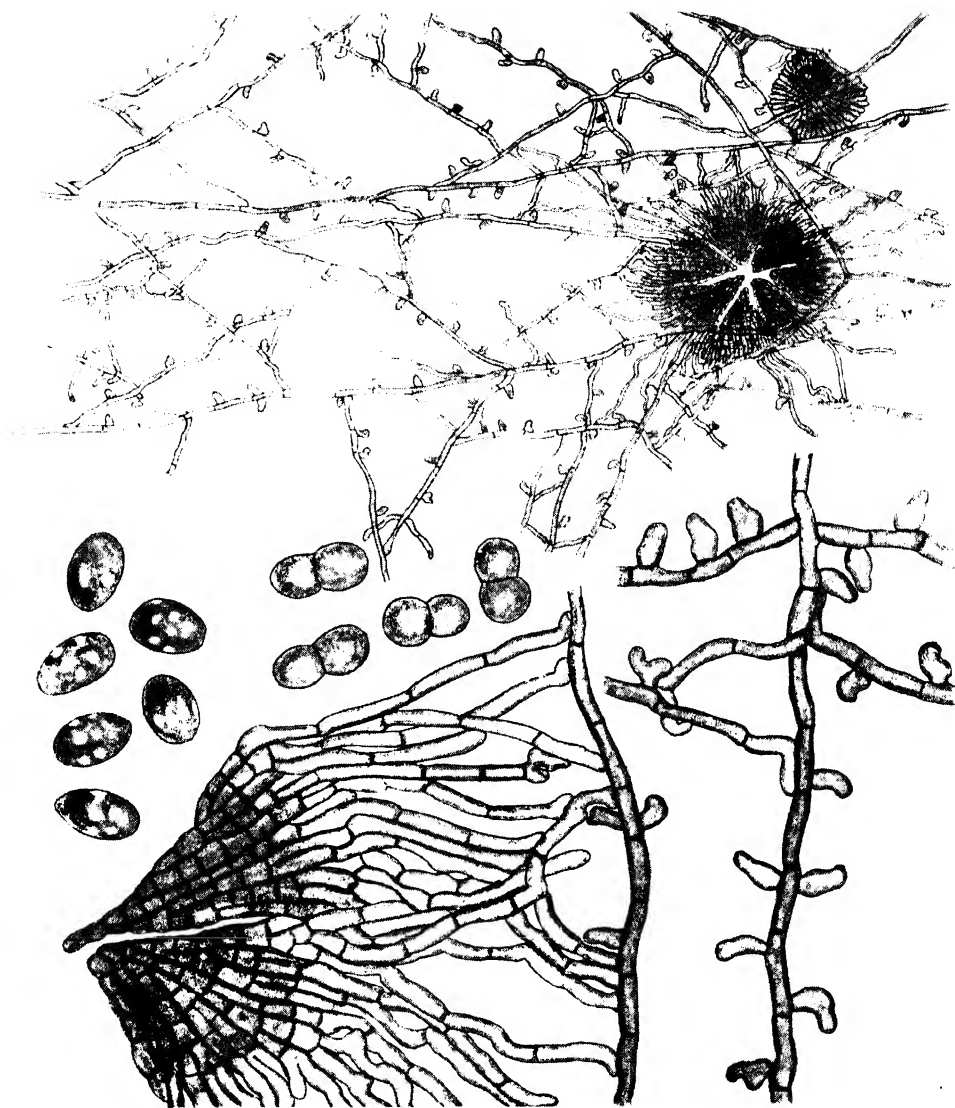


PLATE XXIV.
Asterina Greviae.

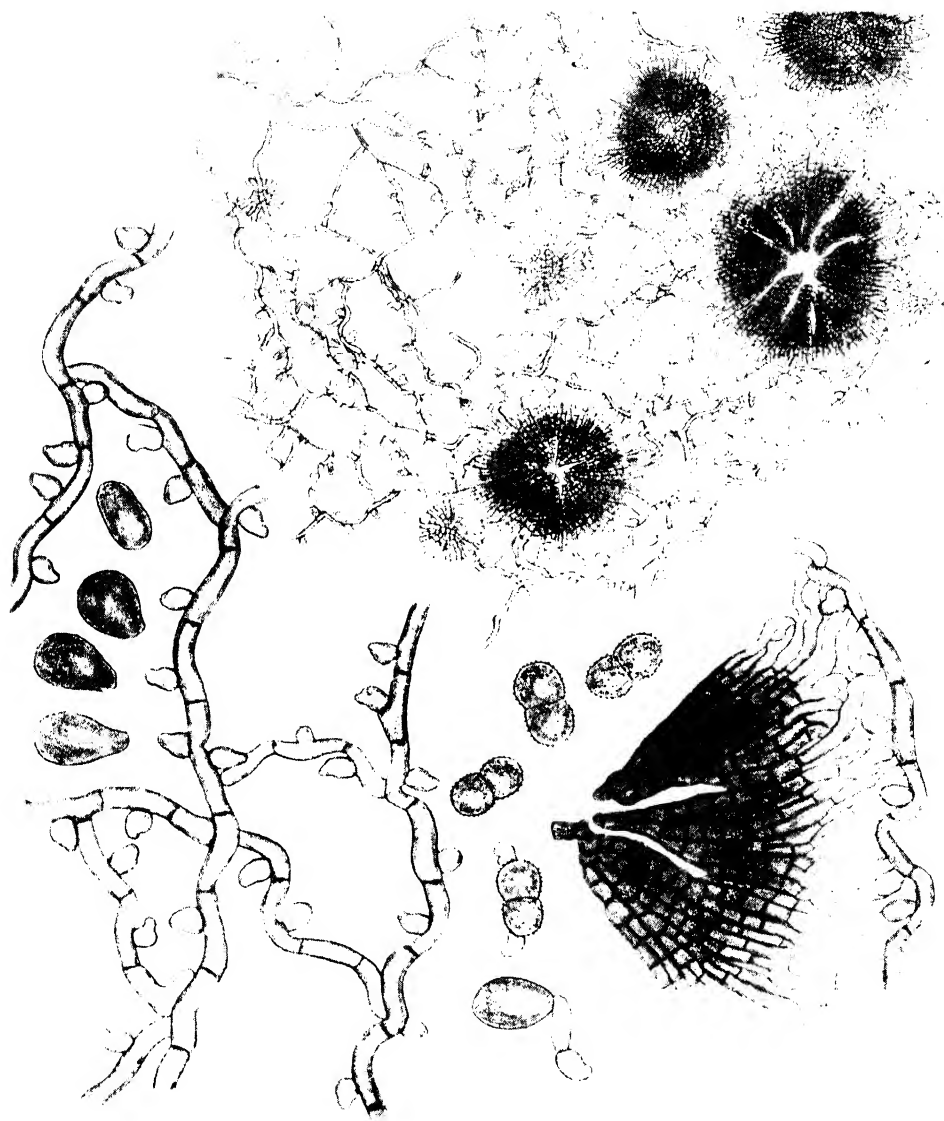


PLATE XXV.
Asterina crotonensis.

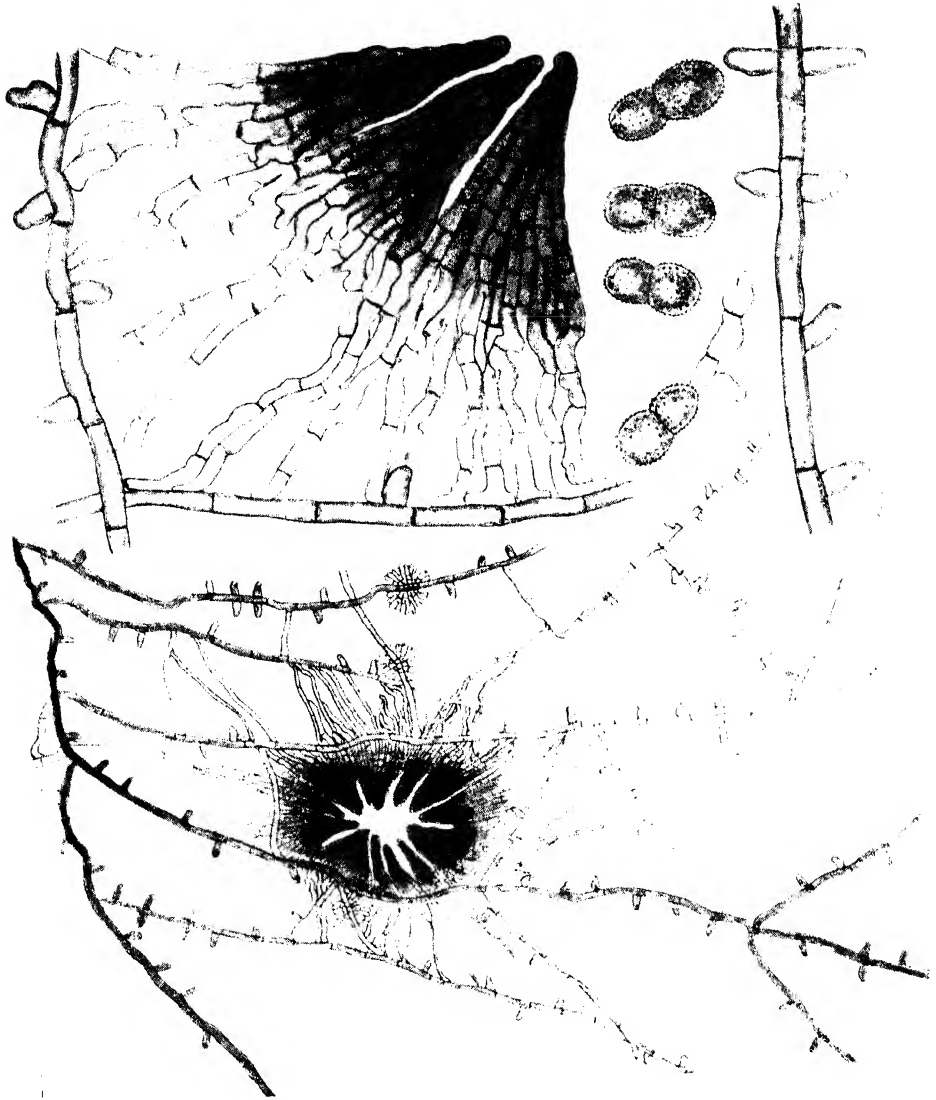


PLATE XXVI.
Asterina Trichilar.

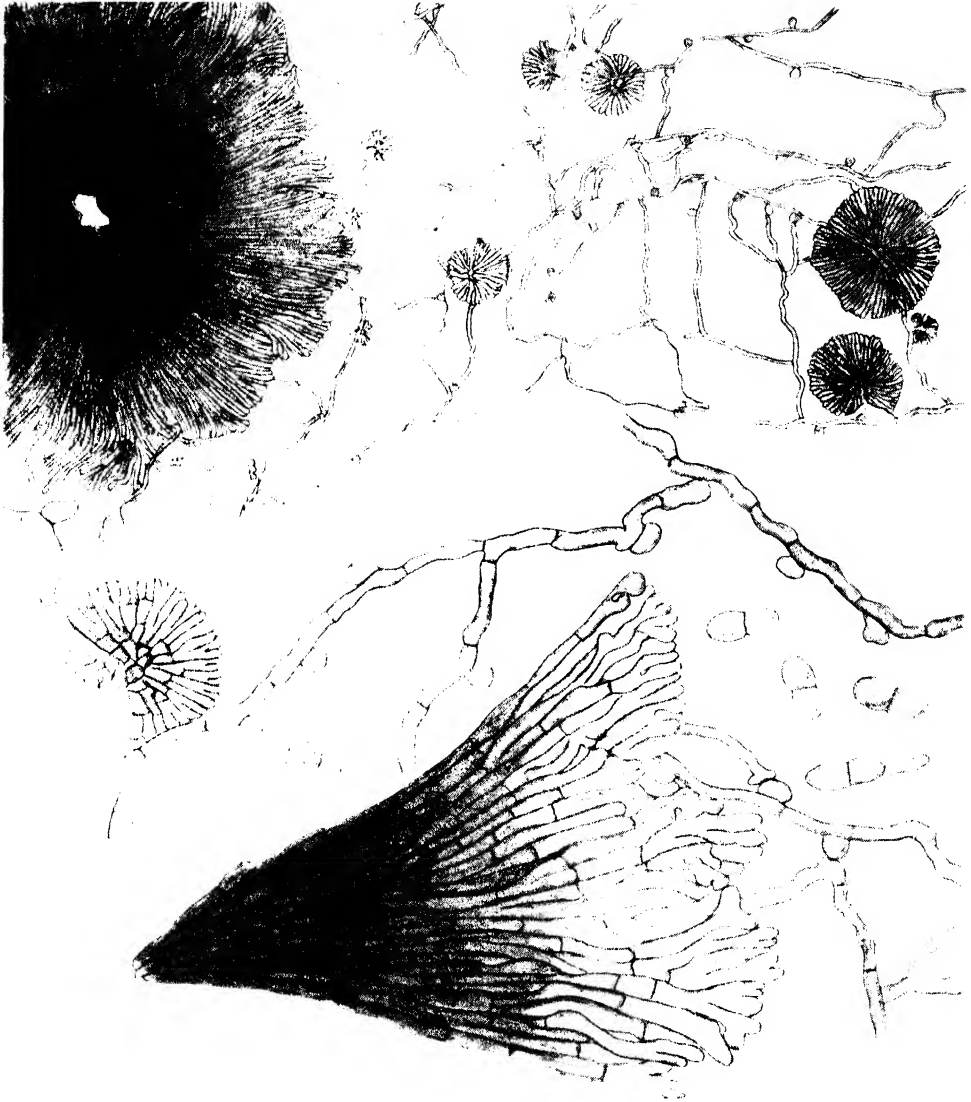


PLATE XXVII.
Asterina Trichocladi.

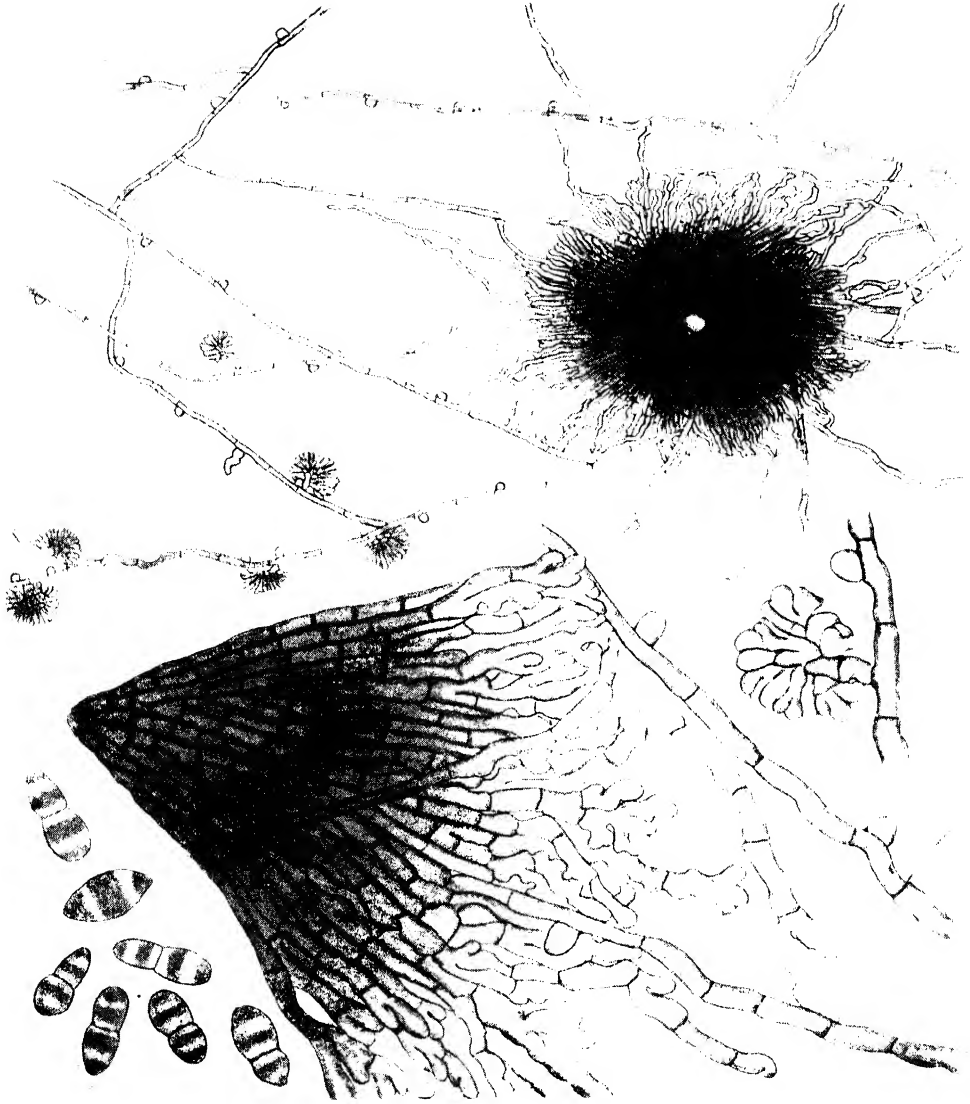


PLATE XXVIII.
Asterina raripoda.

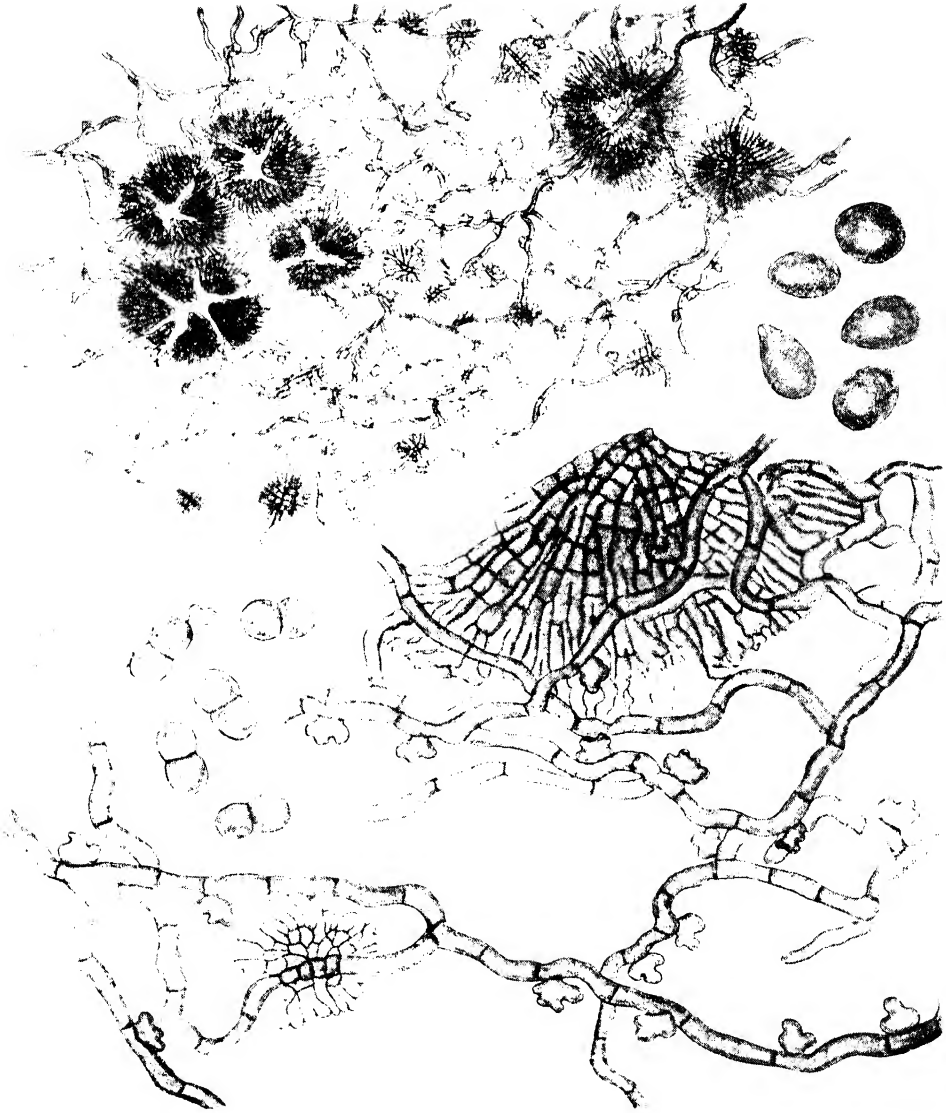


PLATE XXIX.
Asterina Paroniac.

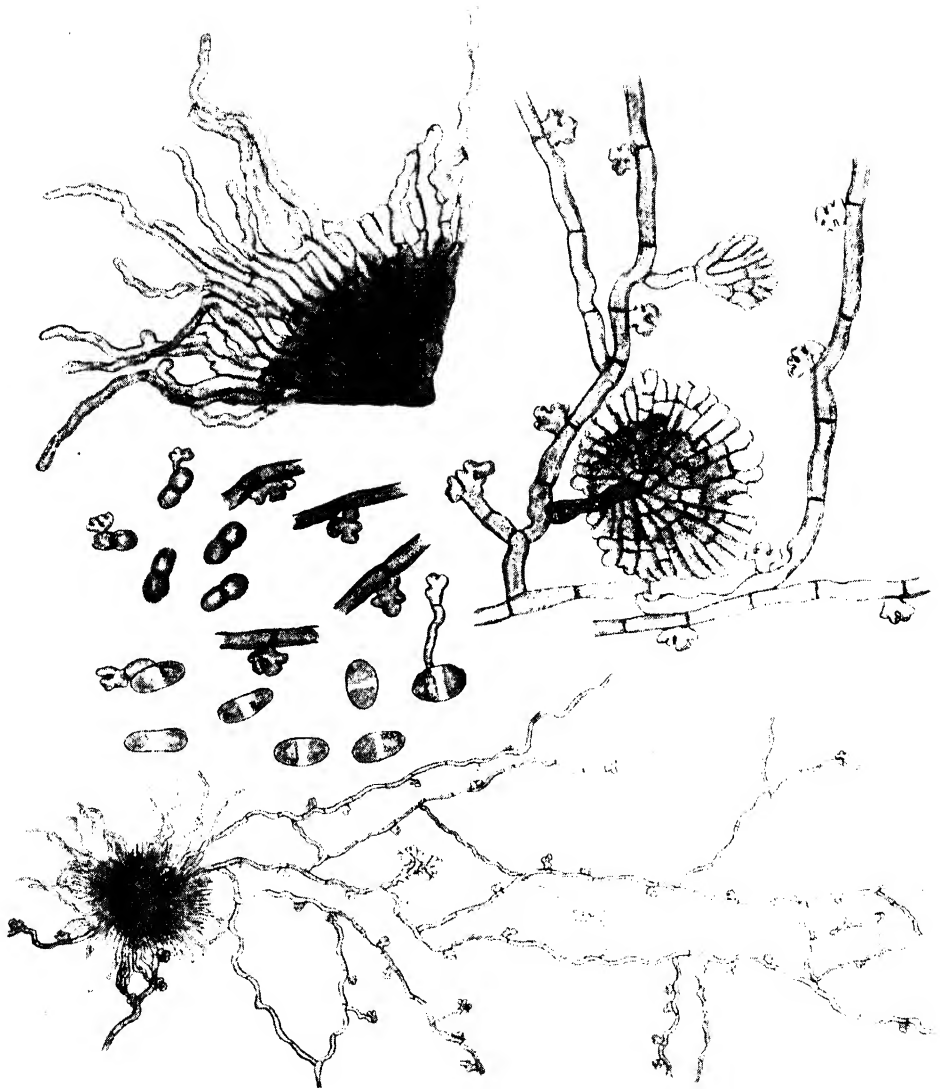


PLATE XXX.
Asterina rumenensis.

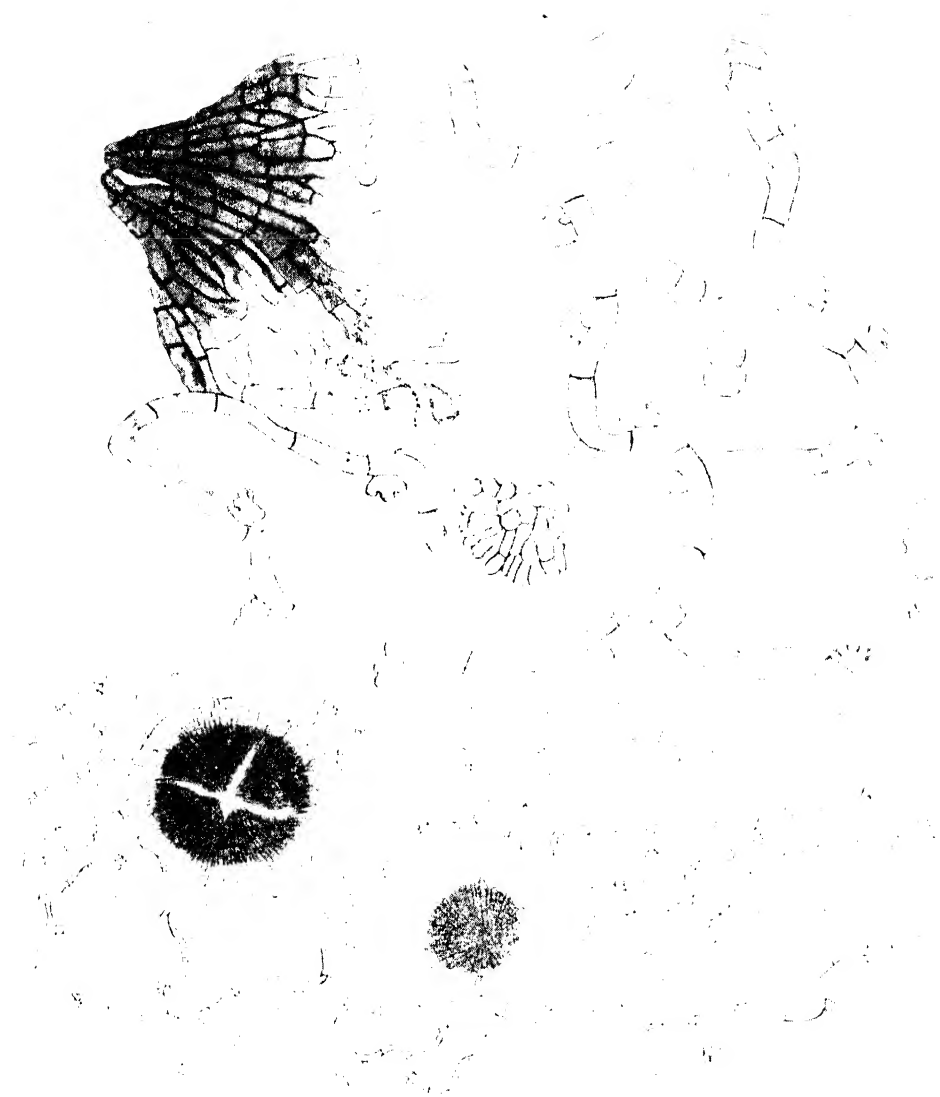


PLATE XXXI.
Asterina undulata.

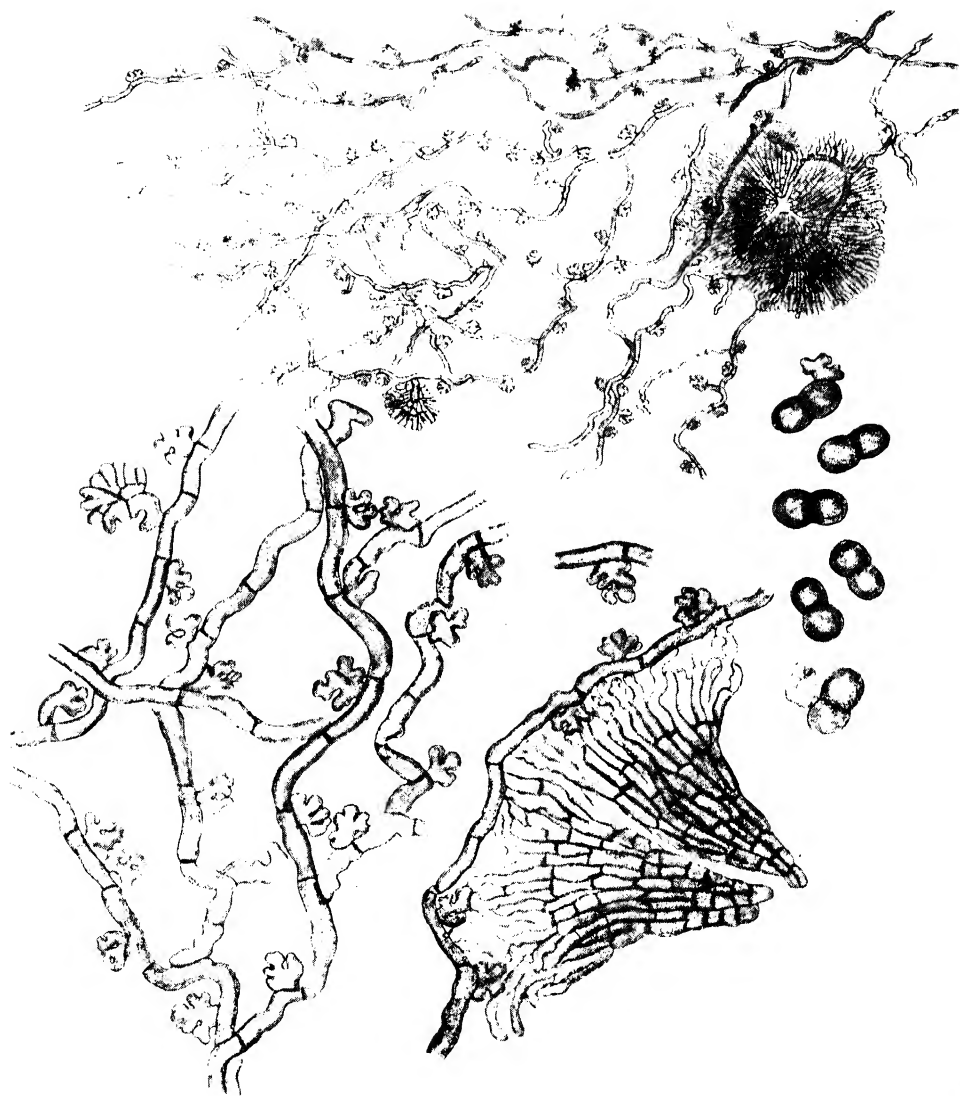


PLATE XXXII.
Asterina Streptocarpa.



PLATE XXXIII.
Asterina gerbericola.

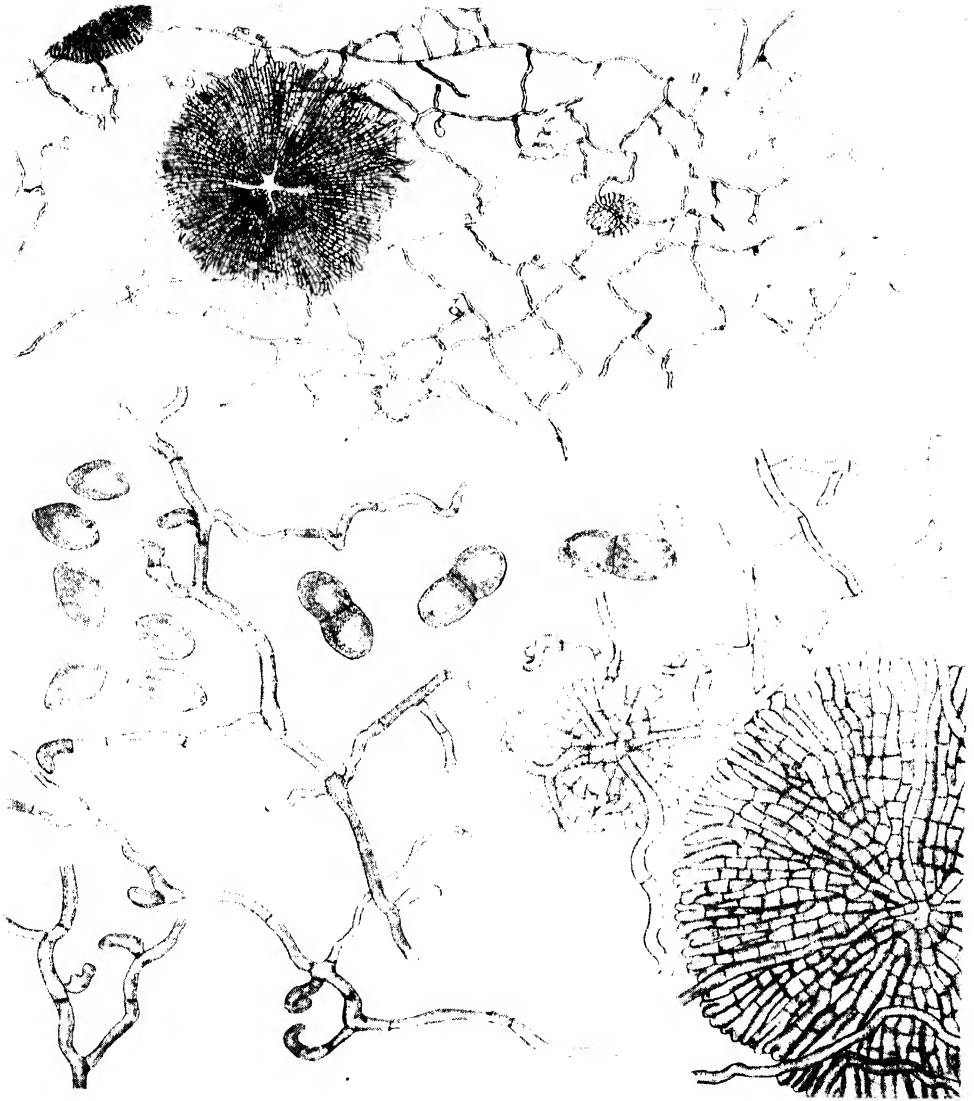


PLATE XXXIV.
Asterina Woodiana.



PLATE XXXV.
Asterina uncinata.

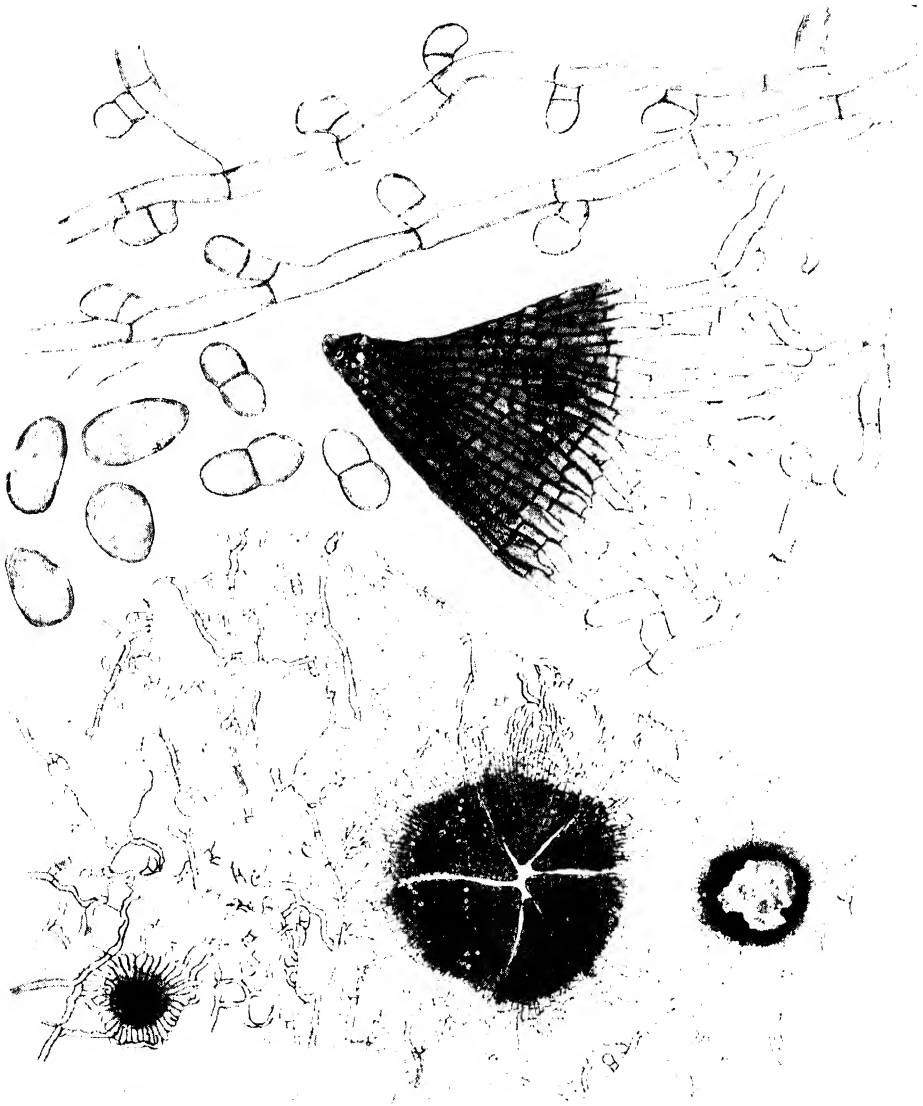


PLATE XXXVI.
Asterina reticulata.



PLATE XXXVII.
Asterina Scolopiar.



PLATE XXXVIII.
Asterina Saniculae.

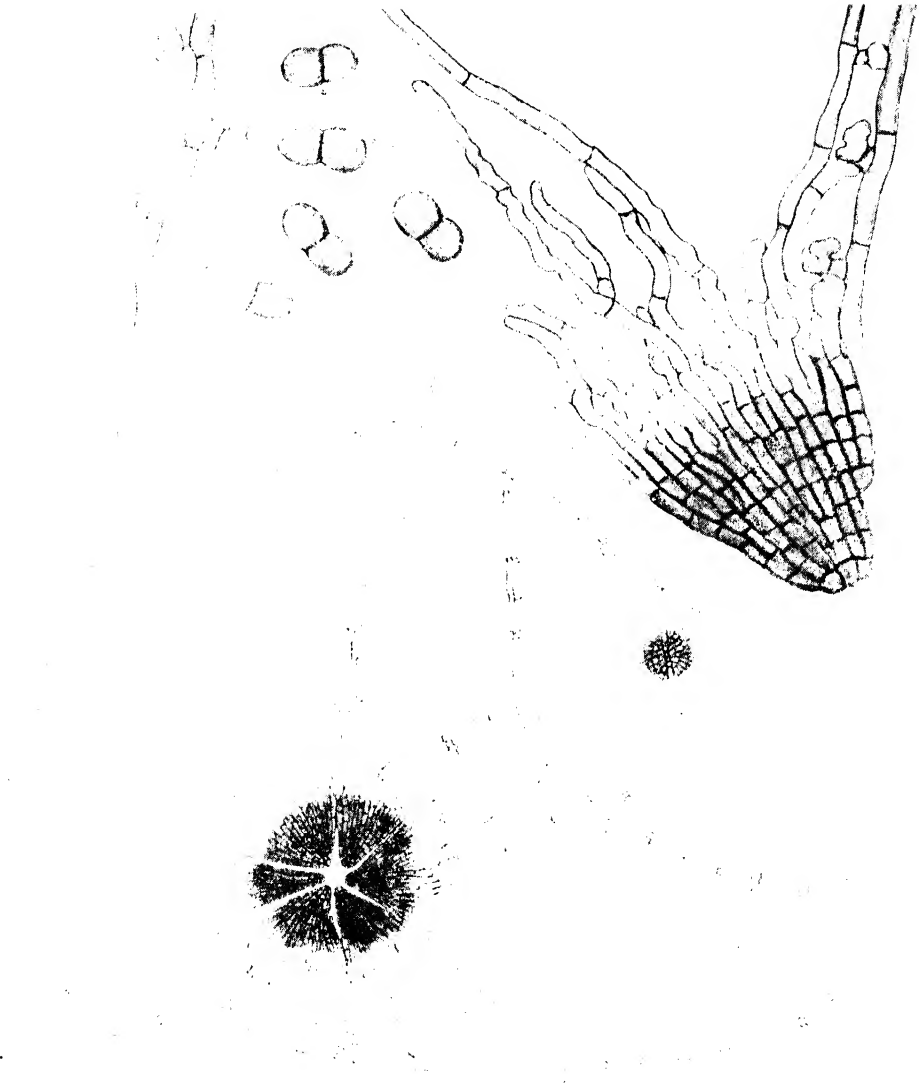


PLATE XXXIX.
Asterina fimbriata.



PLATE XL.
Asterina Combreli.



PLATE XXI.
Asterina Peglerae.

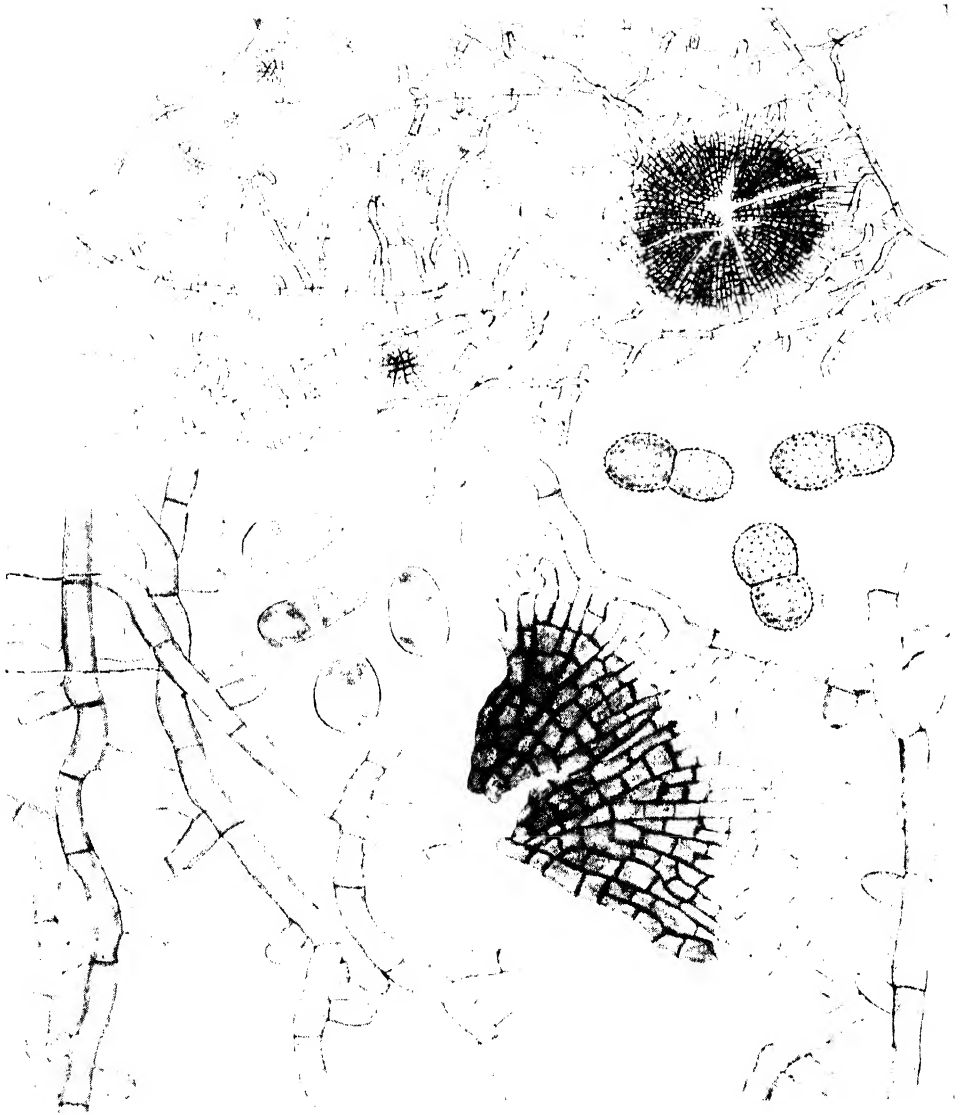


PLATE XLII.
Asterina loranthicola.

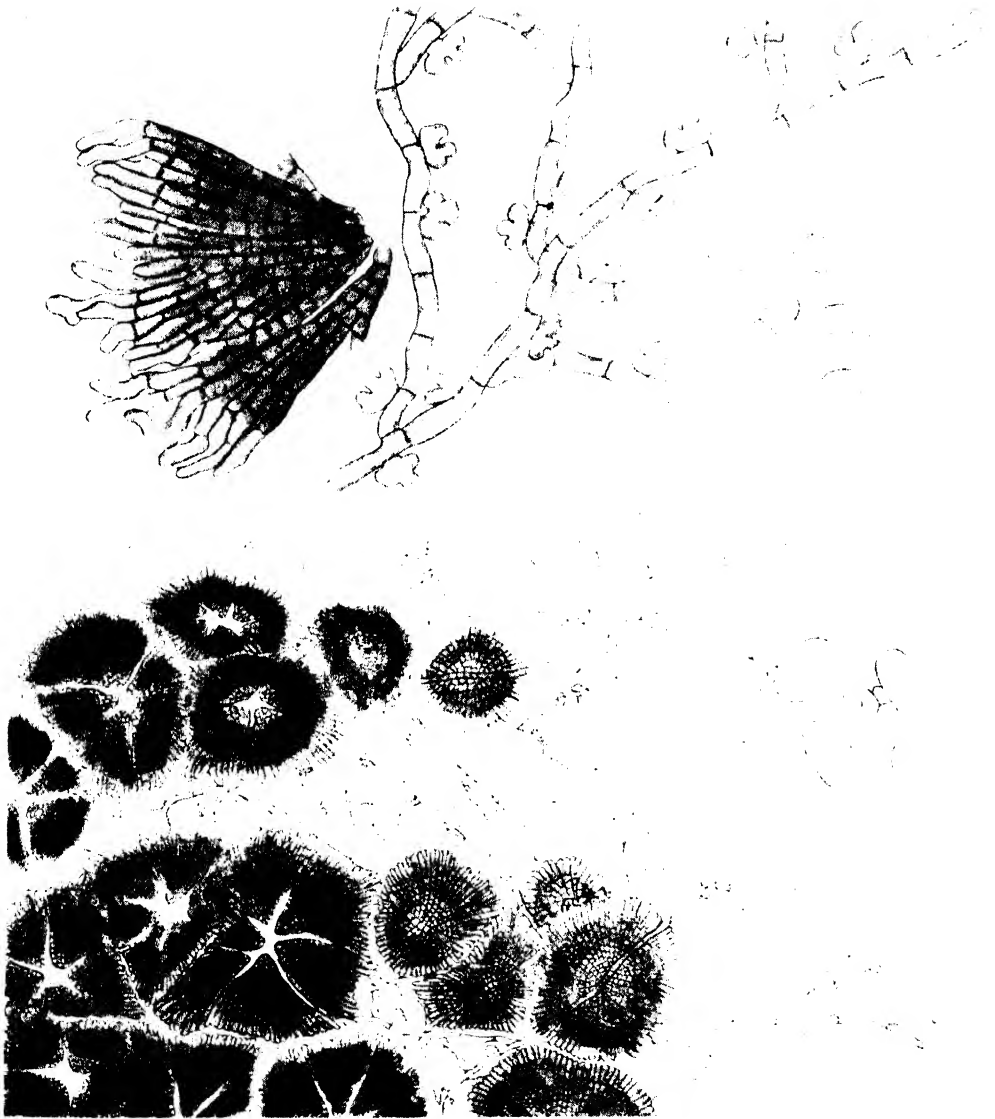


PLATE XLIII.
Asterina polythyria.

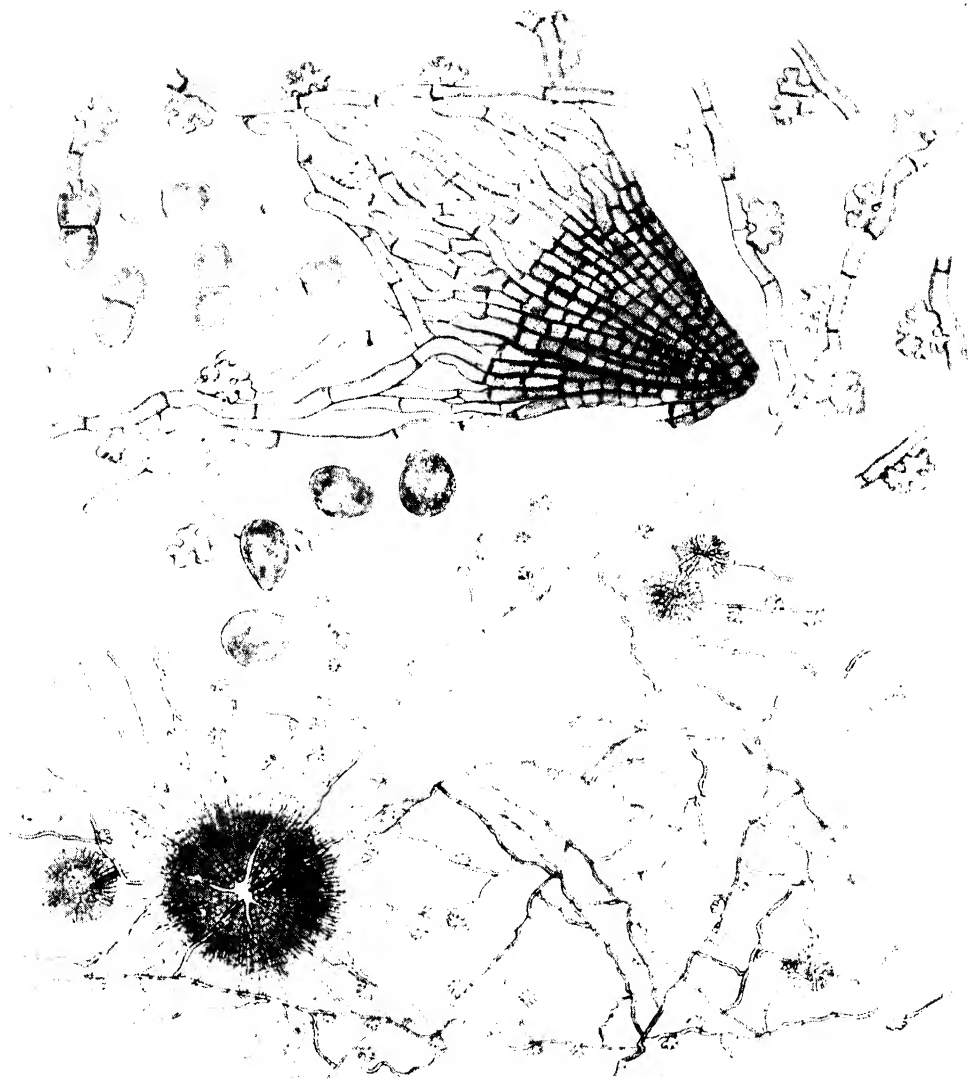


PLATE XLIV.
Asterina clausenicola.

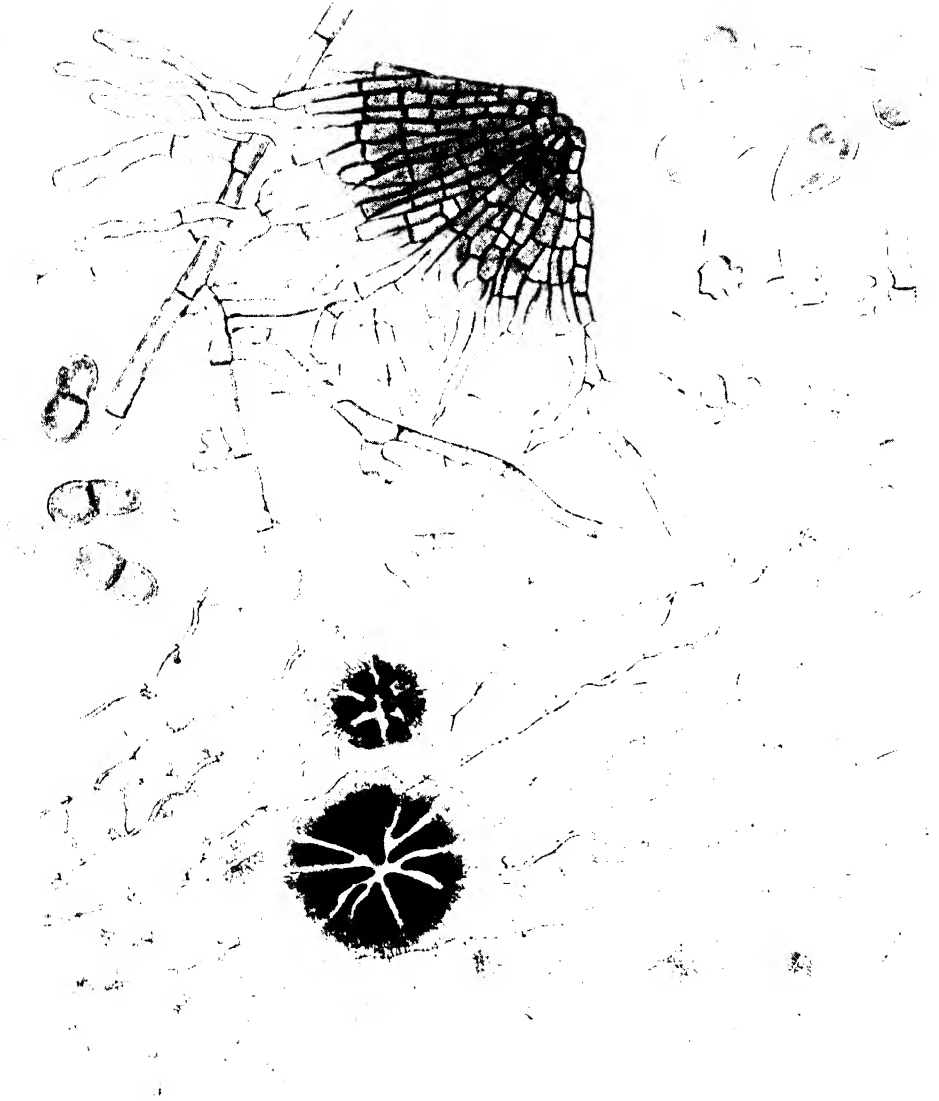


PLATE XLV.
Asterina crsiphoides.

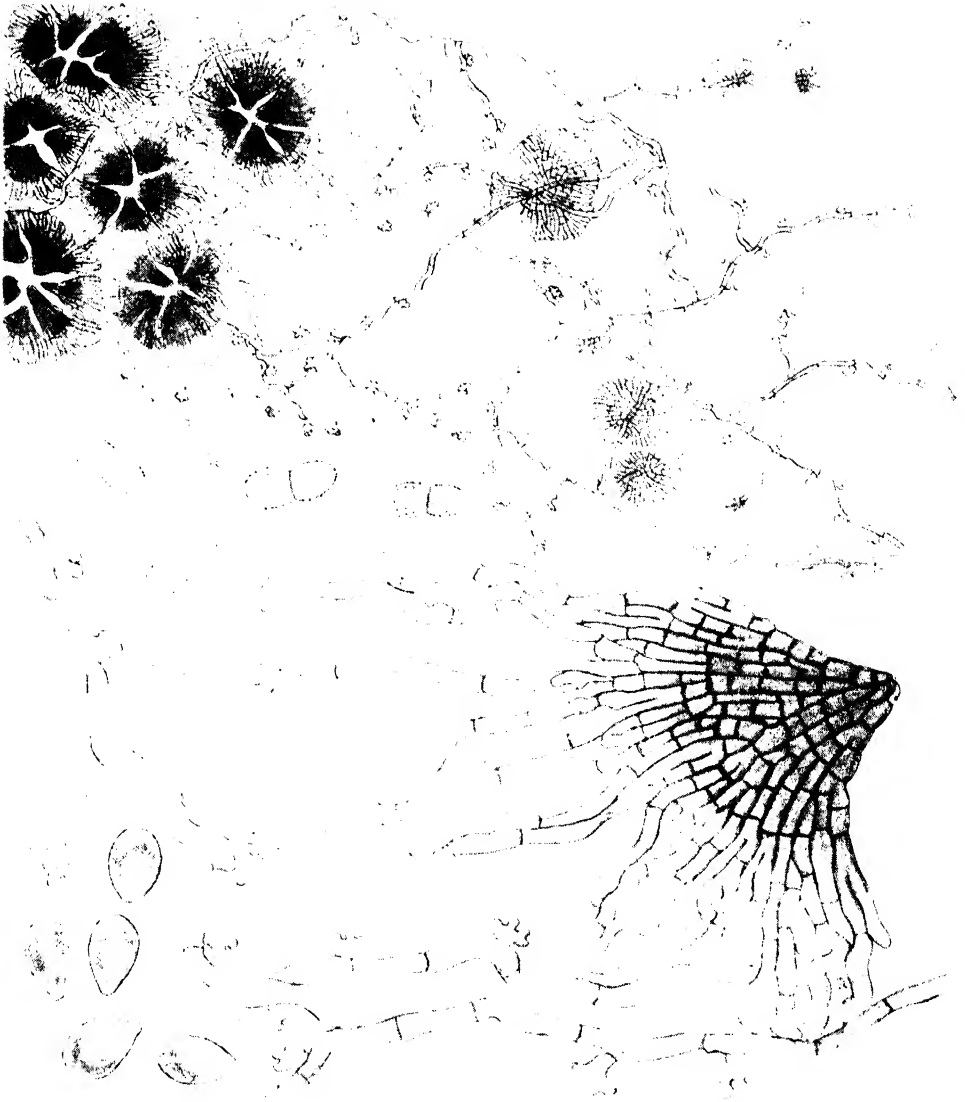


PLATE XLVI.
Asterina tertius var. *africana*.



PLATE XLIX.
Asterina Flemingi.

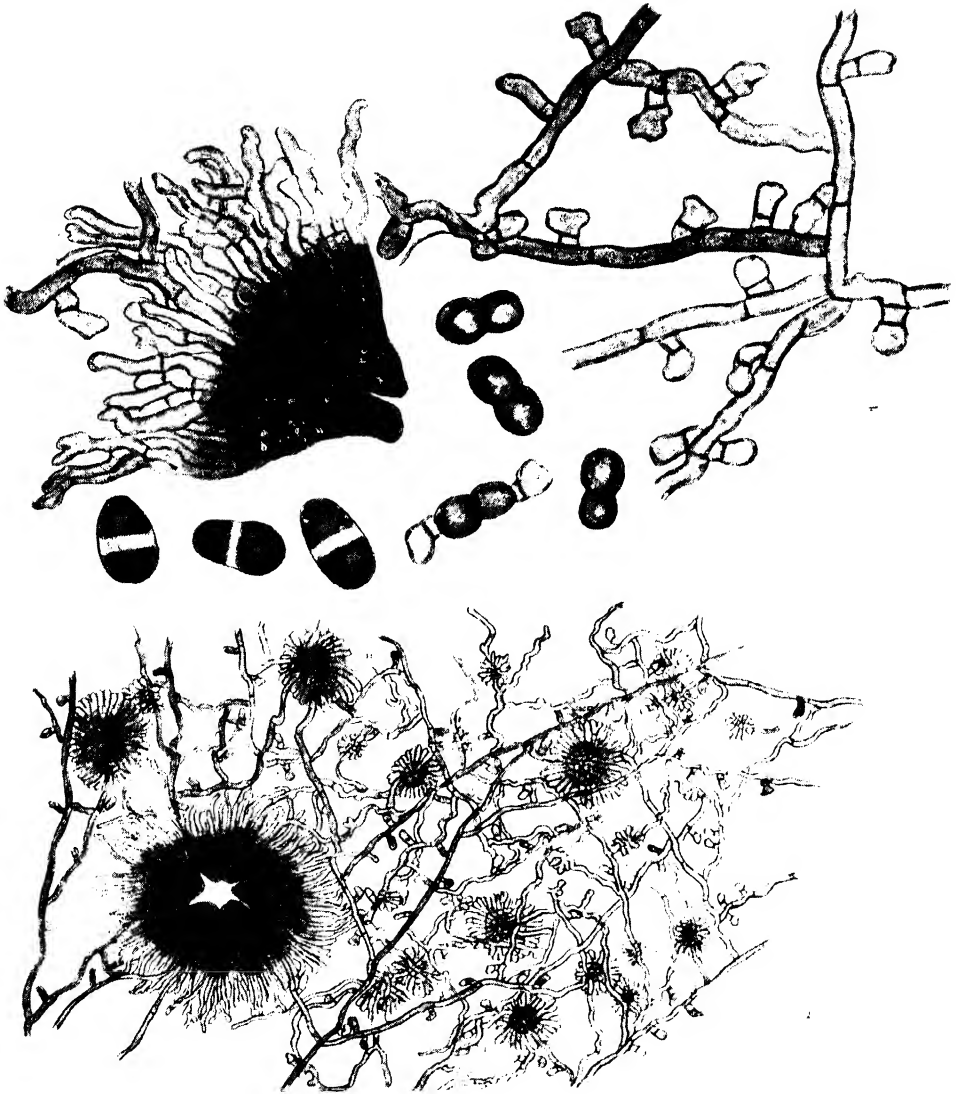


PLATE L.
Asterina van der Bylii.

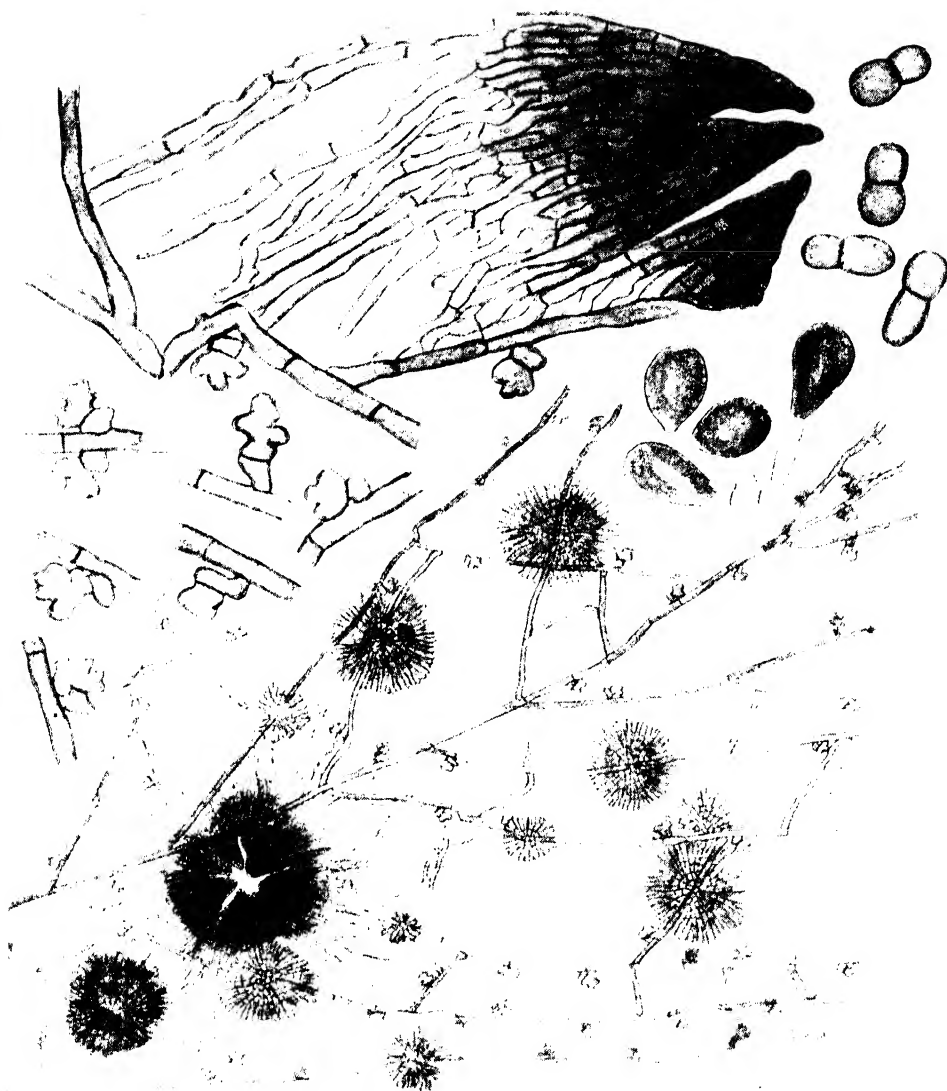


PLATE LI.
Asterina peraffinis.

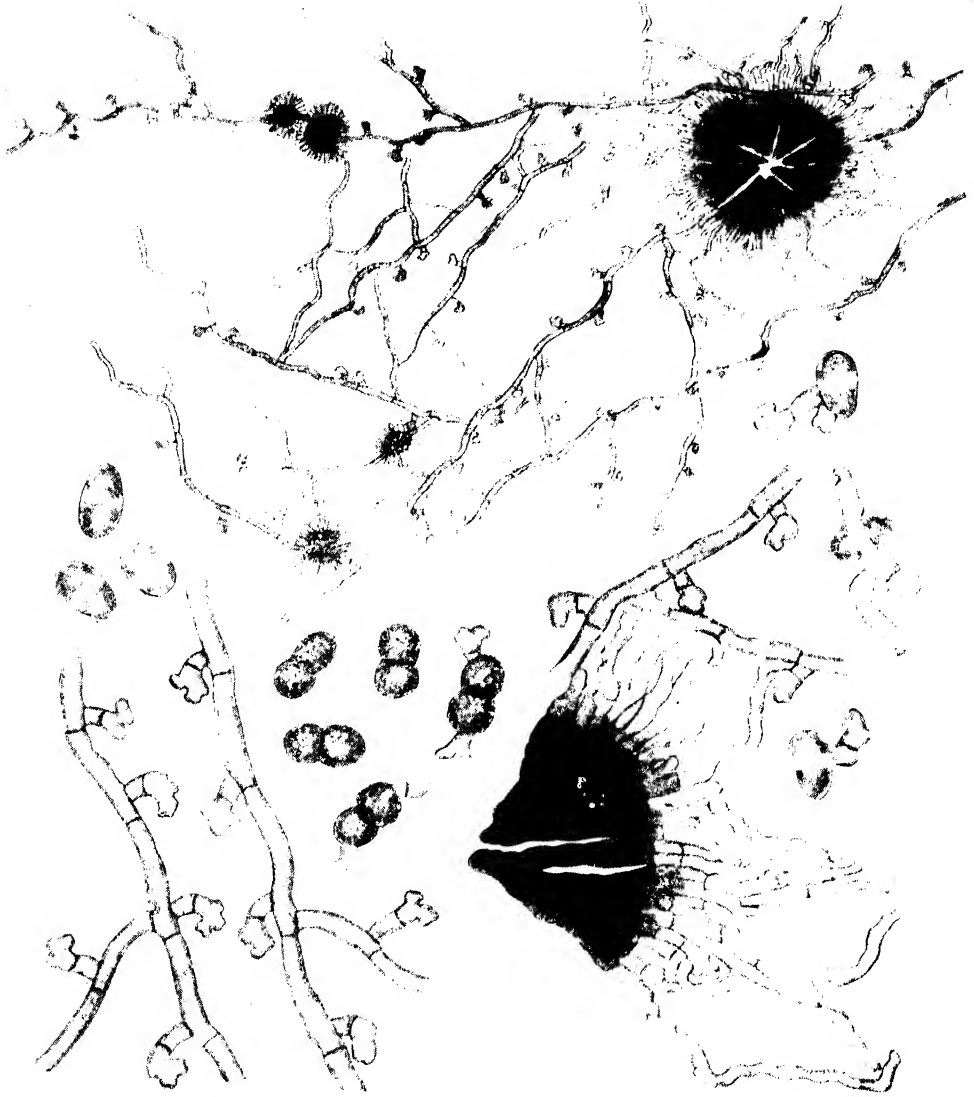


PLATE LIII.
Asterina radio-fissilis.

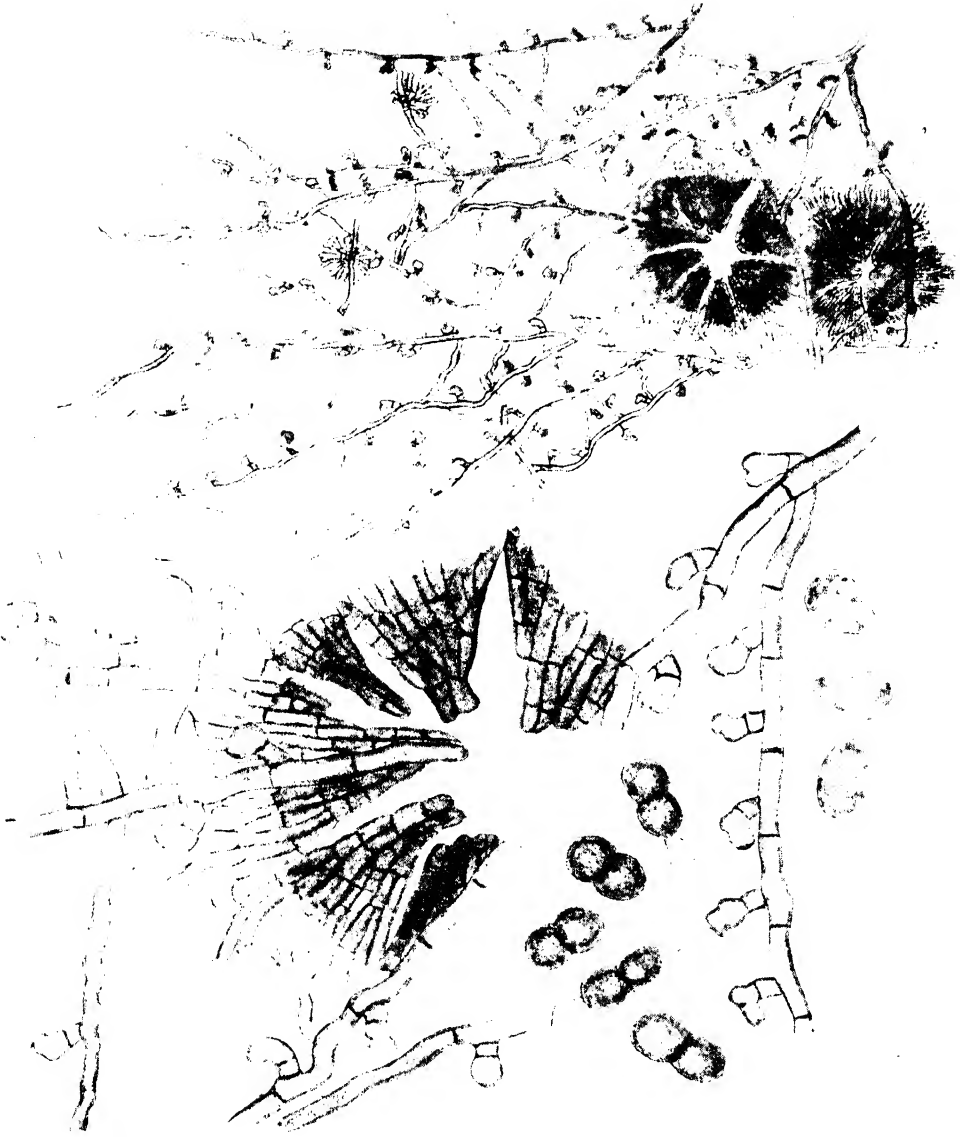


PLATE LIII.
Asterina africana.

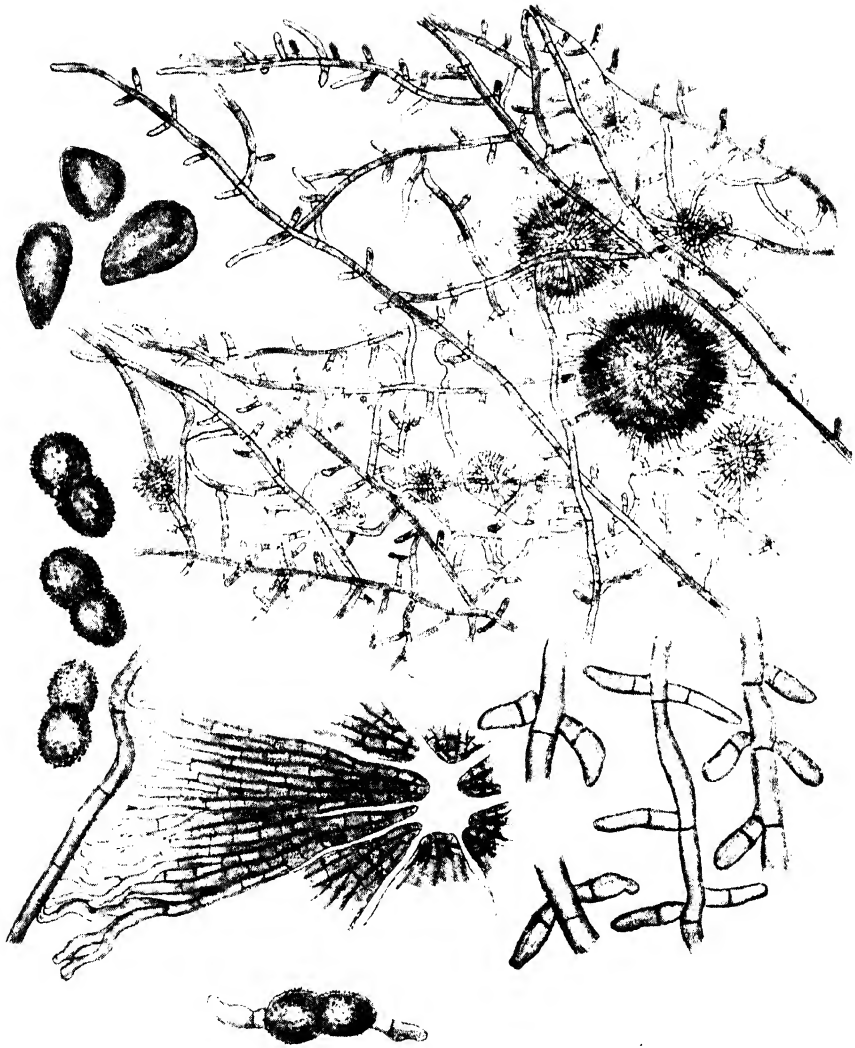


PLATE LIV.
Asterina elegans.

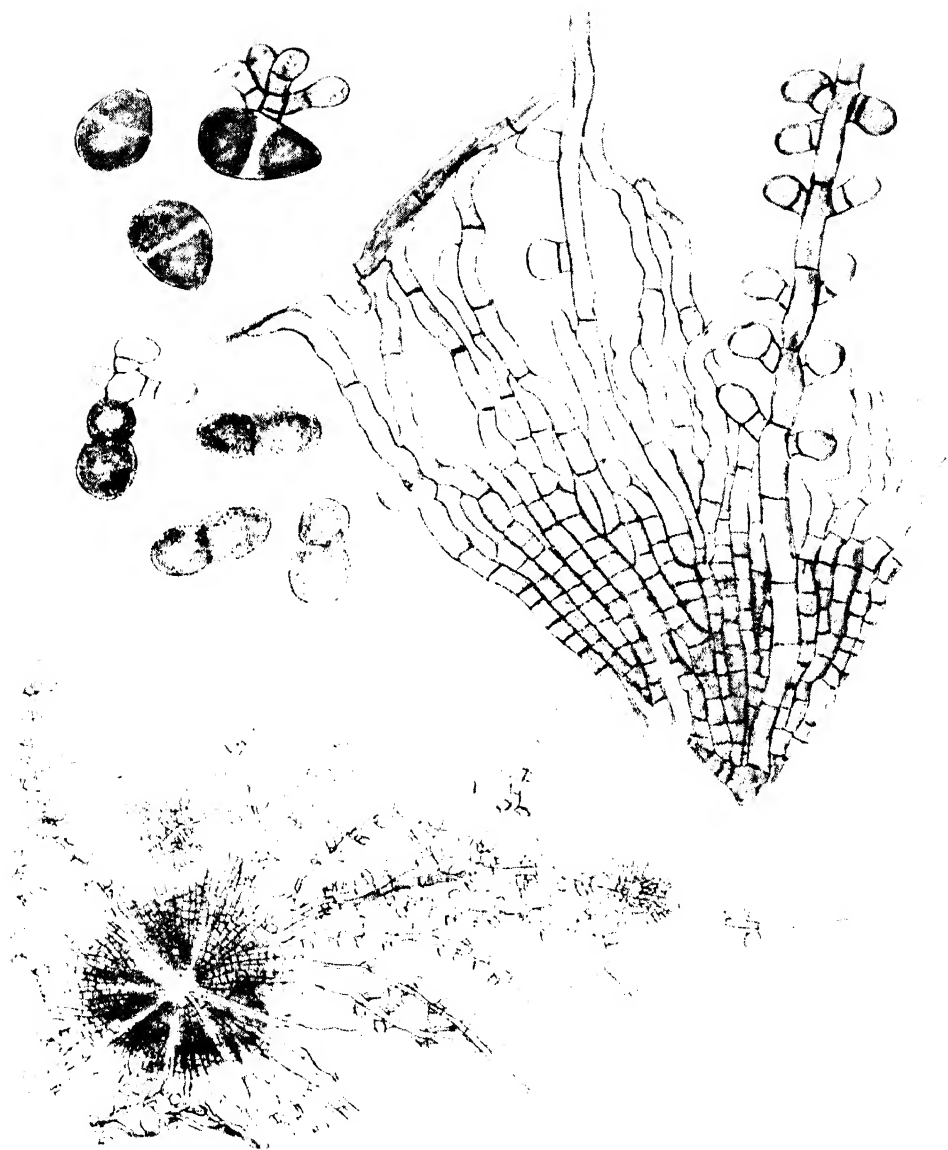


PLATE LV.

Asterina capparidicola.

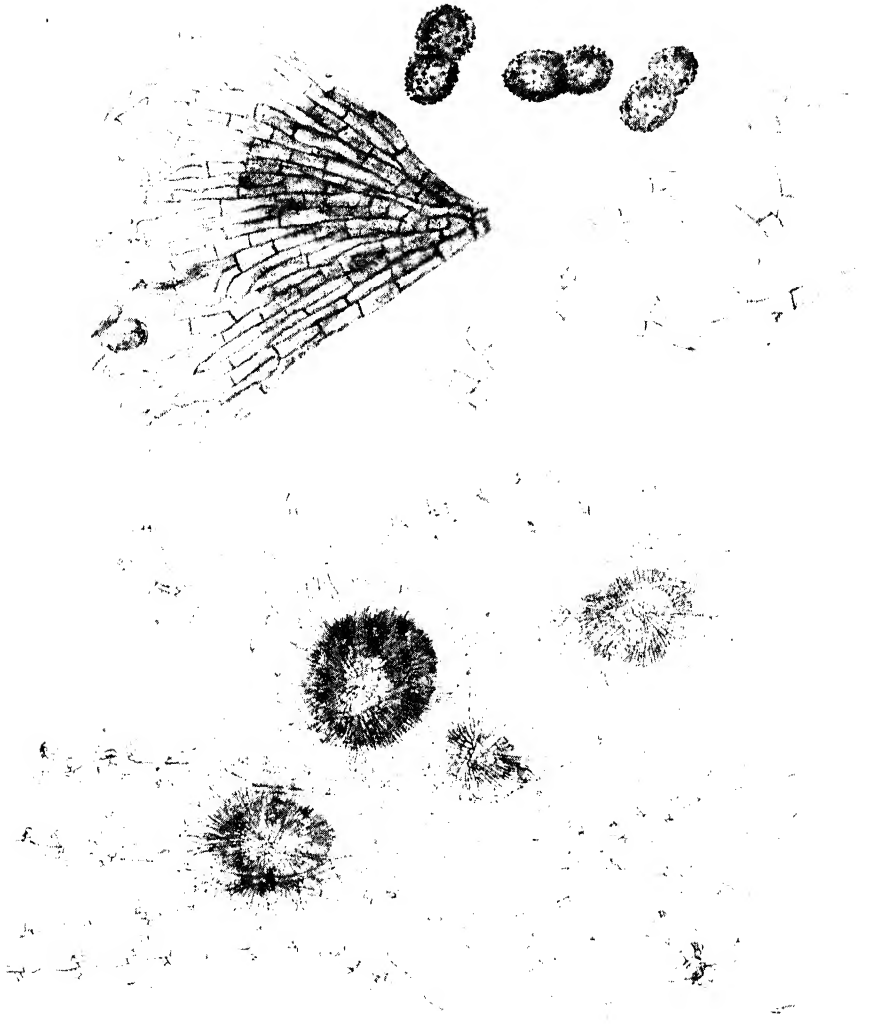


PLATE LVI.
Asterina Woodii.

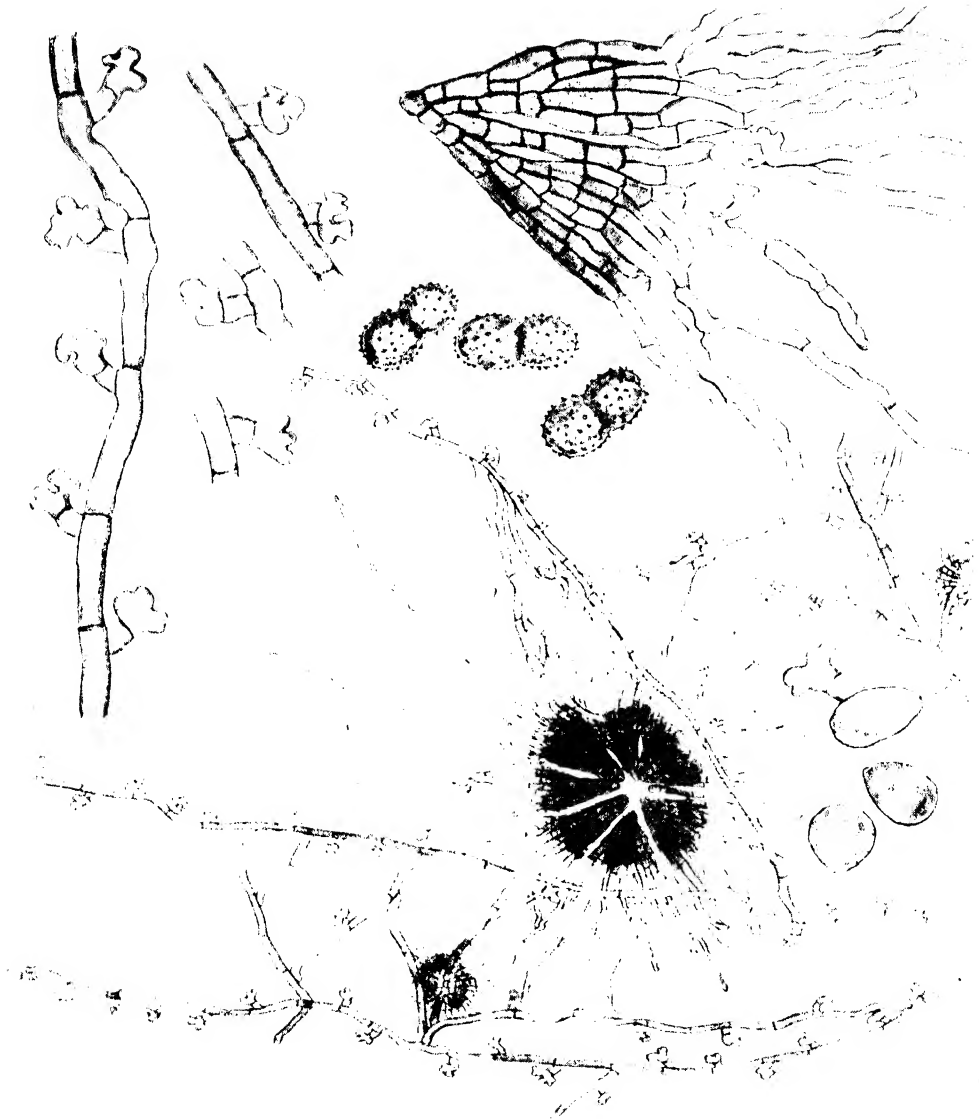


PLATE LVII.
Asterina Rinorea.



PLATE LVIII.
Clupeolella psychotriac.

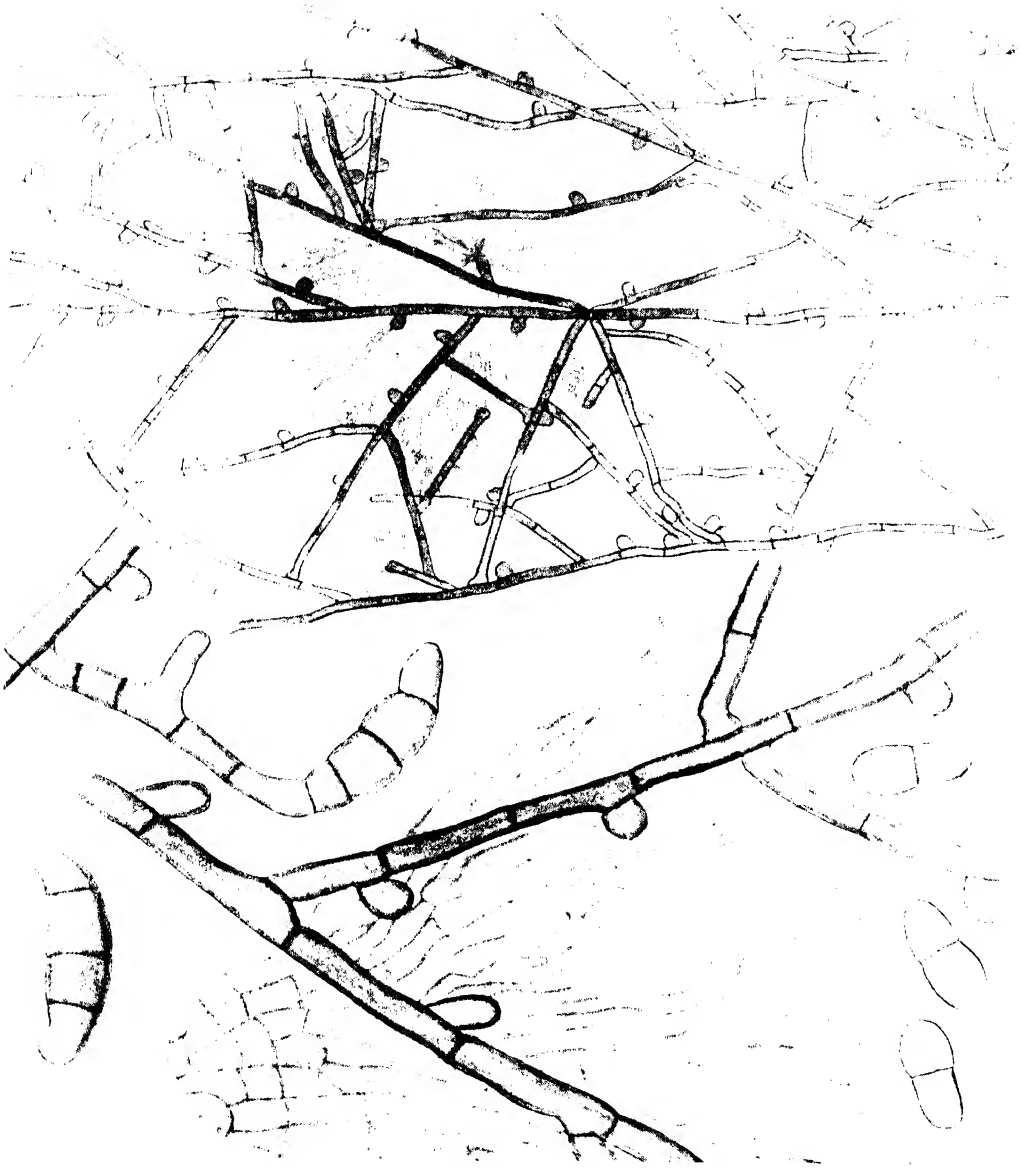


PLATE LIX.
Clypeocella rhamnicola.

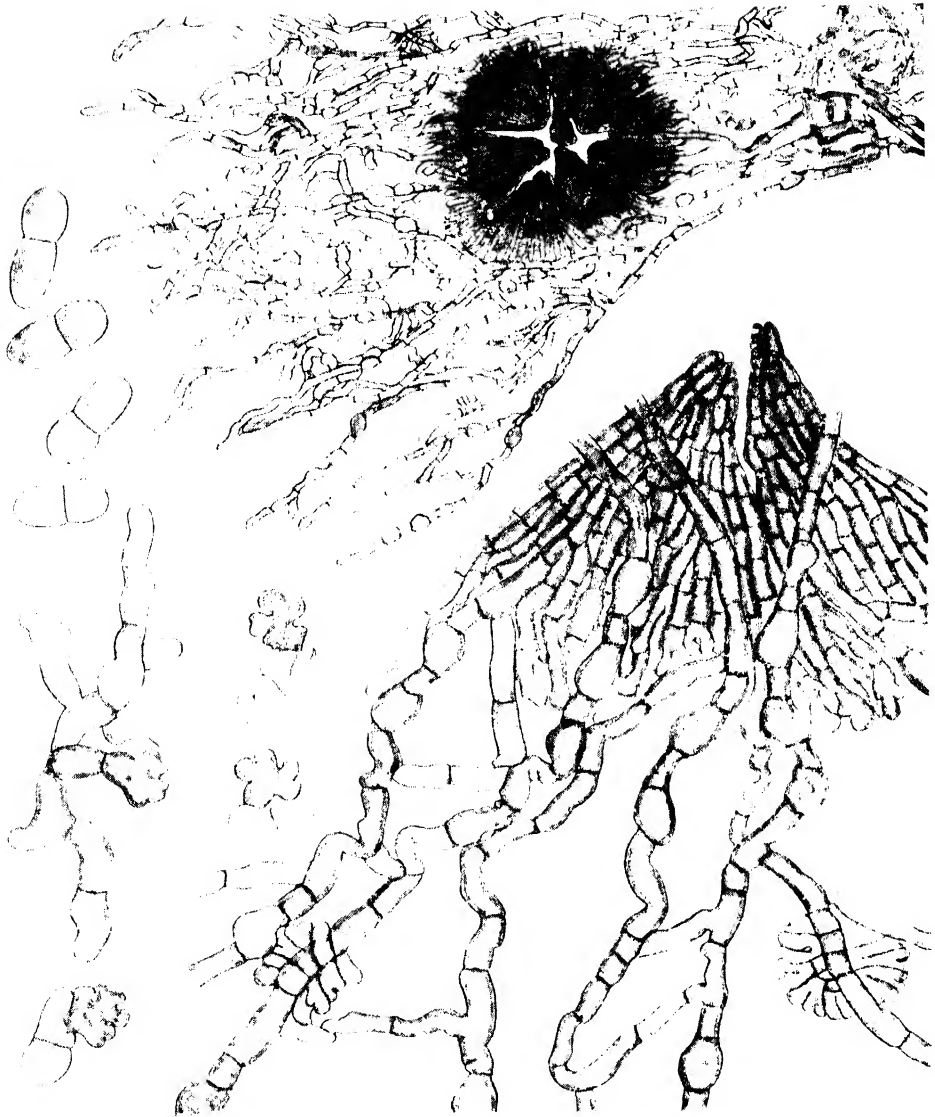


PLATE LX.
Asterolibertia megathyria.

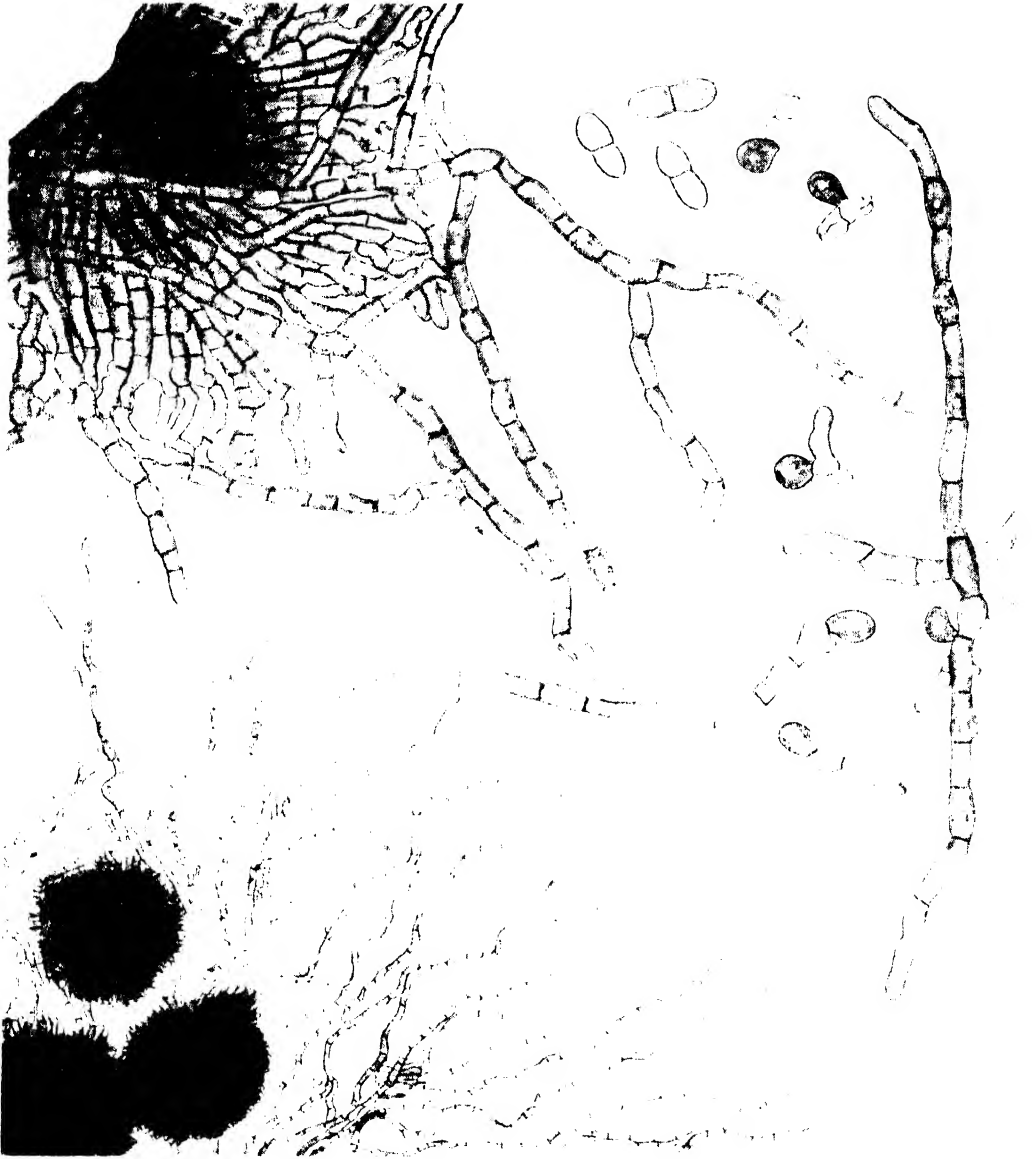


PLATE LXI.
Asterolibertia Burchellii.

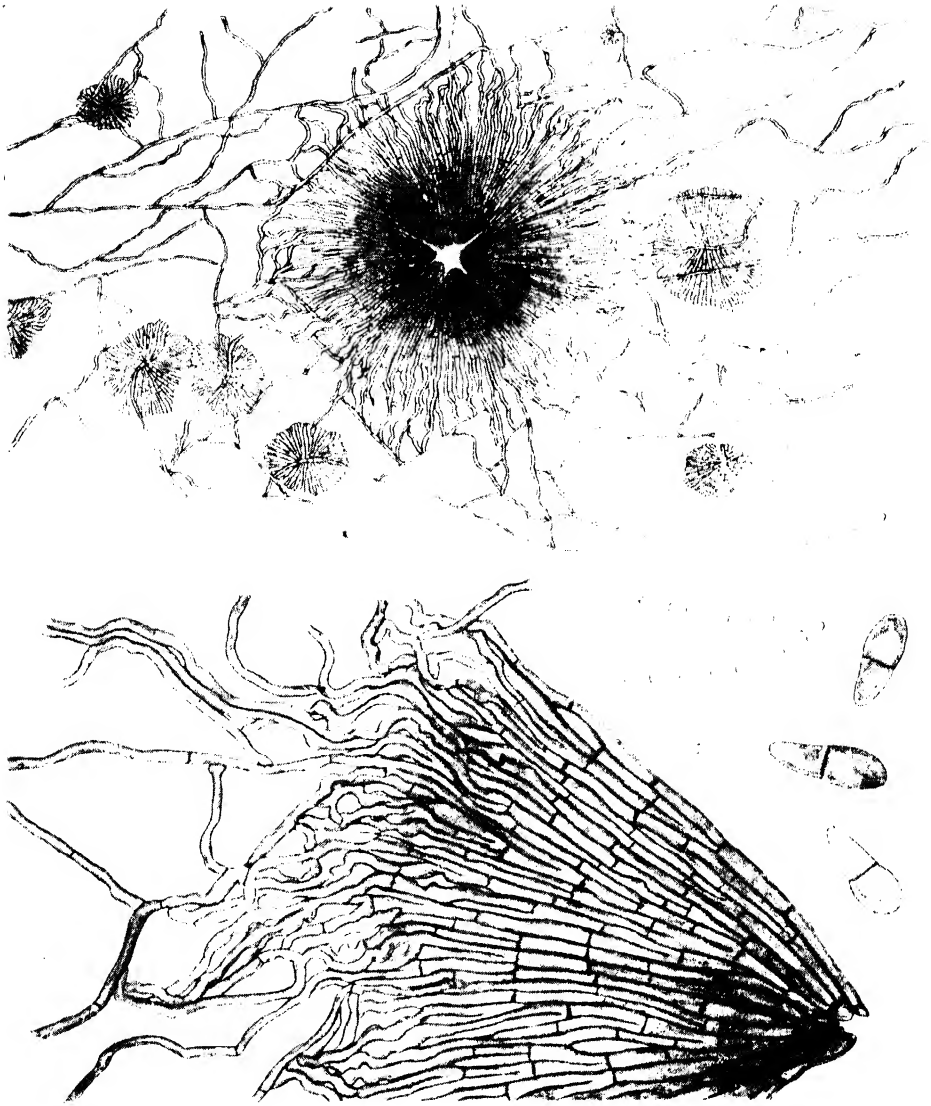


PLATE LXII.
Asterinella Teclae.

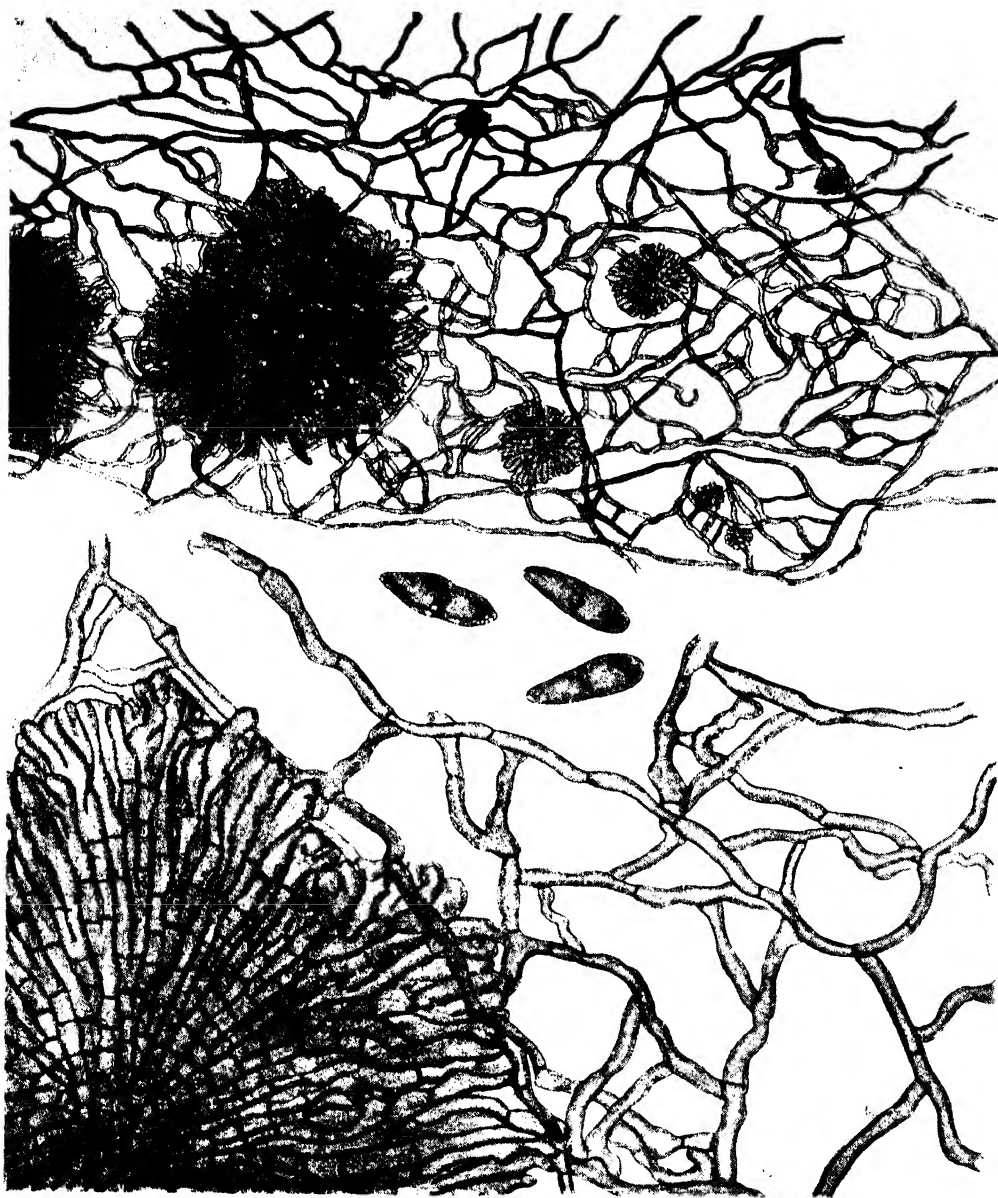


PLATE LXIII.
Asterinella Pteroclastri.



PLATE LXIV.
Asterinella Mimusopsidis.

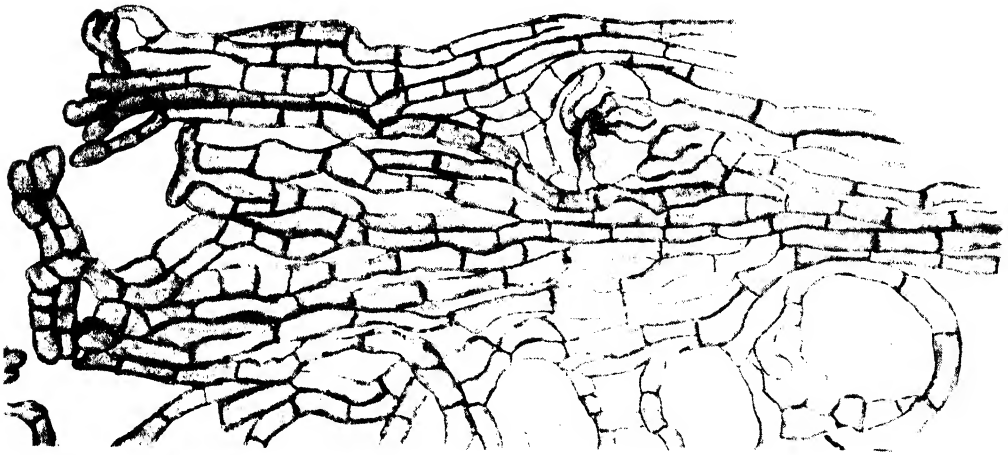
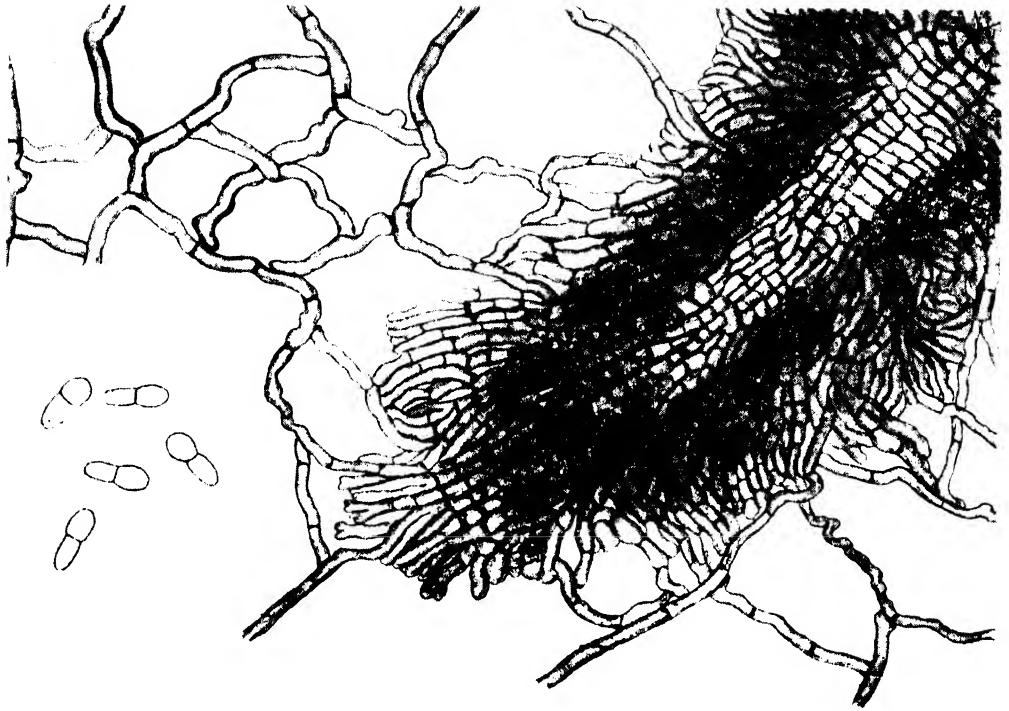


PLATE LXV.
Lemnisciopsis eucalyptina.

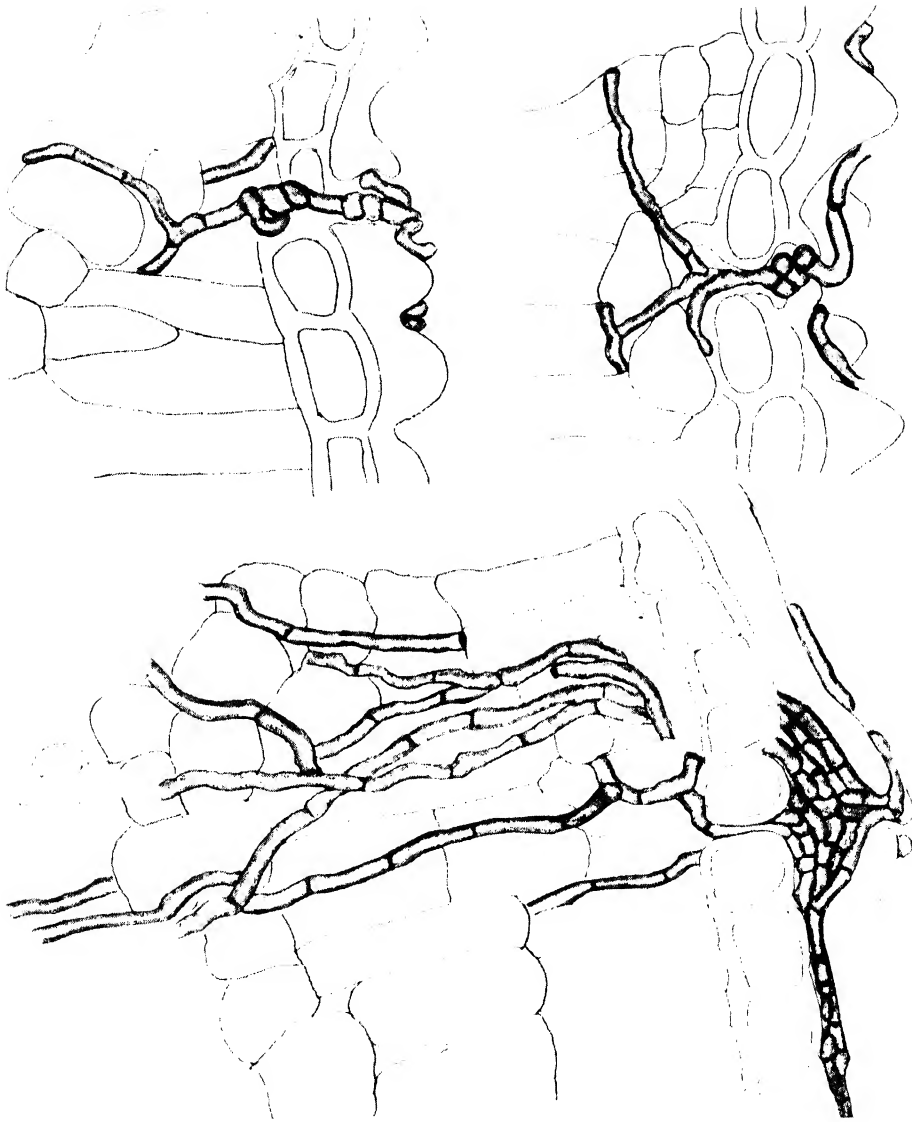


PLATE LXVI.
 Sections through leaves of
 above (a) (b) *Eucalyptus gigantea*,
 Below (c) *Eucalyptus globulus*,
 showing internal mycelium of *Lembosiosis eucalyptina*.



PLATE LXVII.
Lembosia Phillipsii.

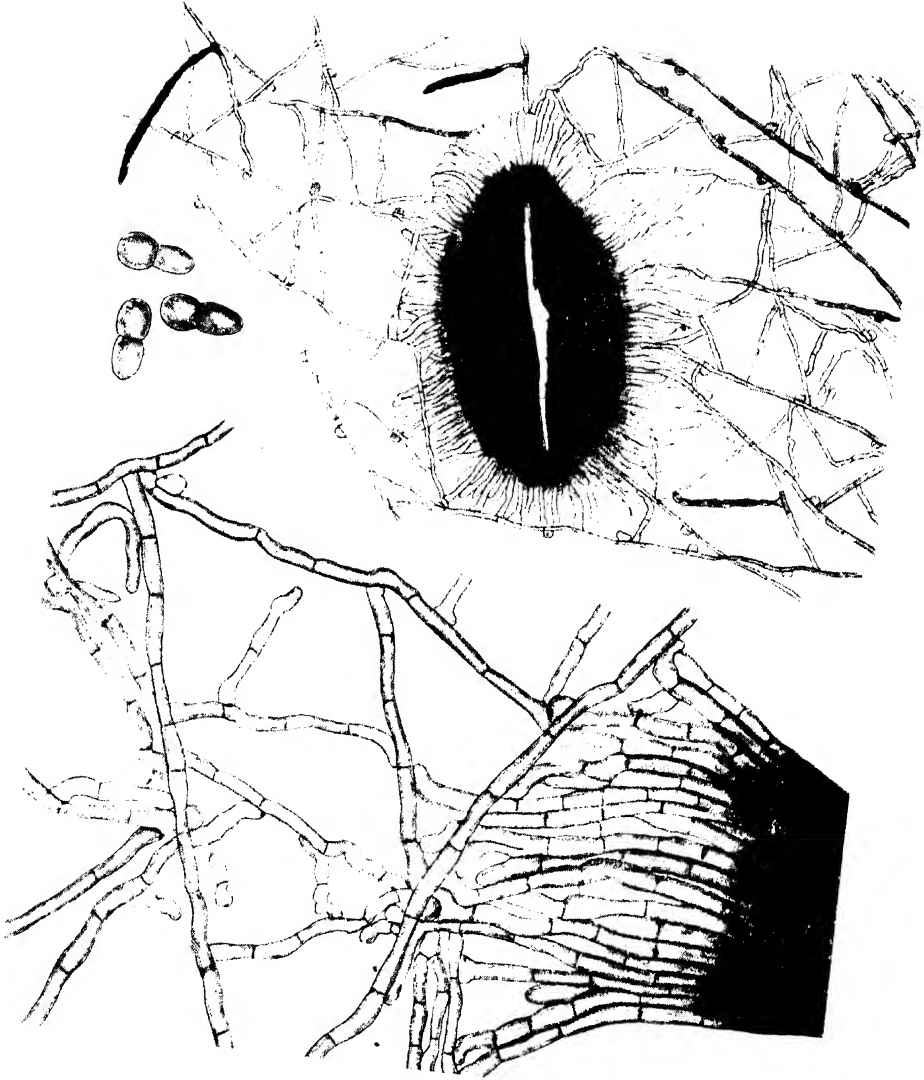


PLATE LXVIII.
Lembosia piriensis.



PLATE LXIX.
Lumbosia Wageri.

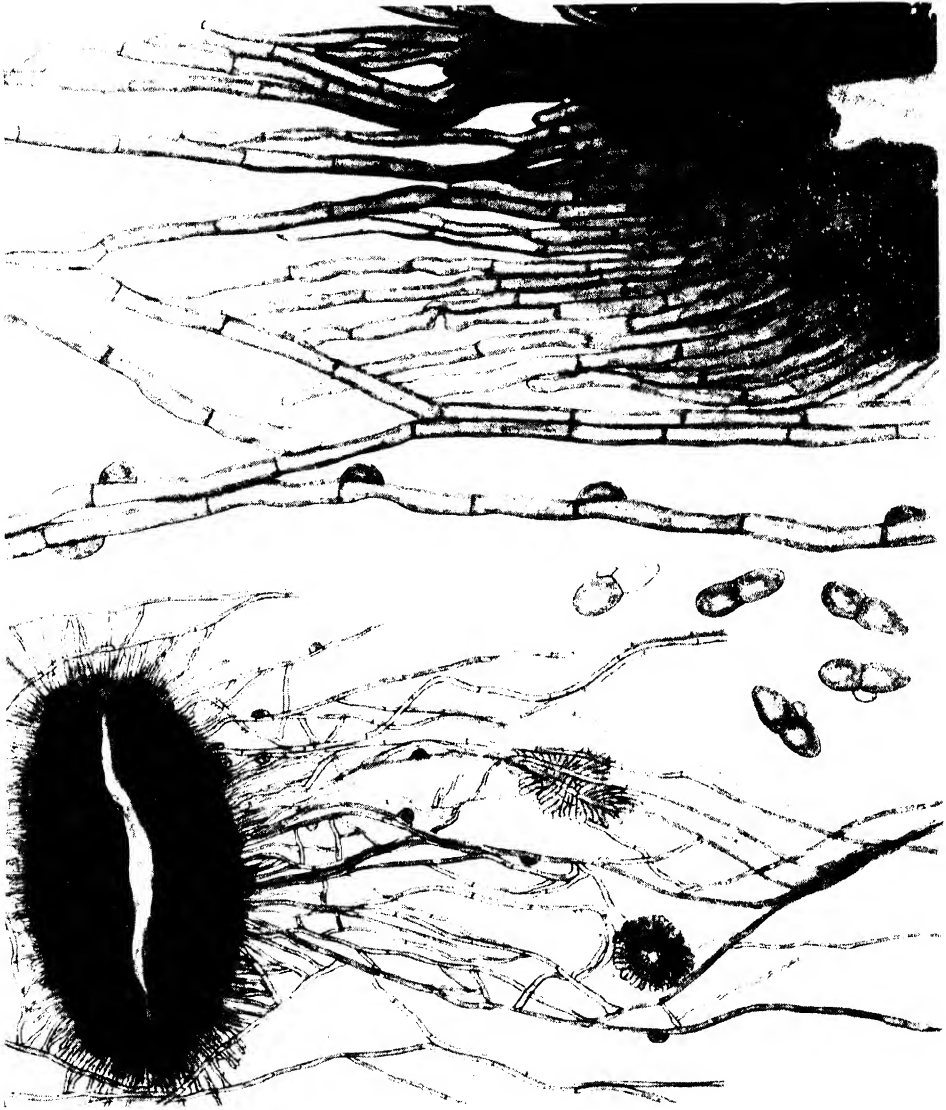


PLATE LXX.
Lembosia durbandi.

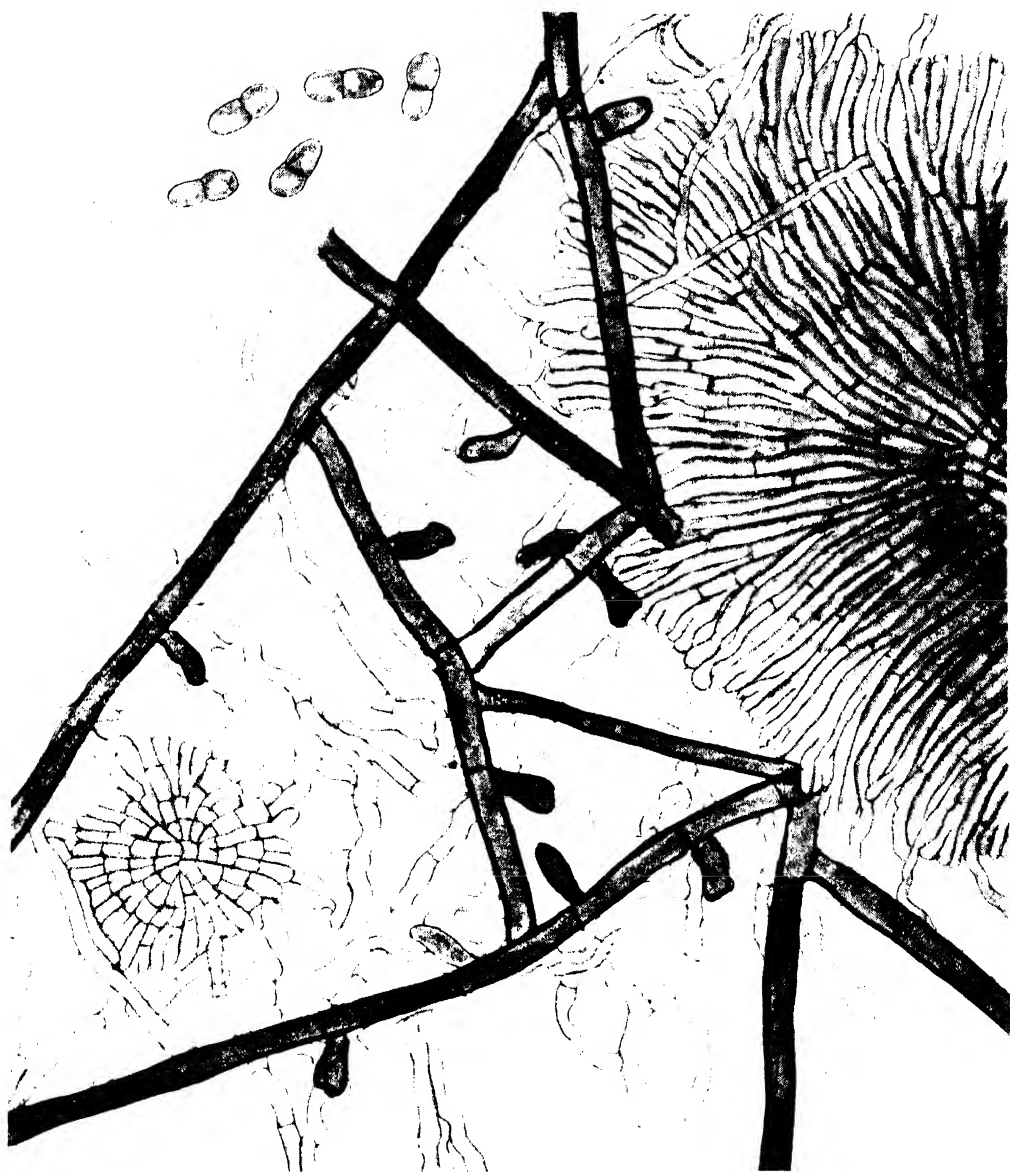


PLATE LXXI.
Echidnoides lembosoides.

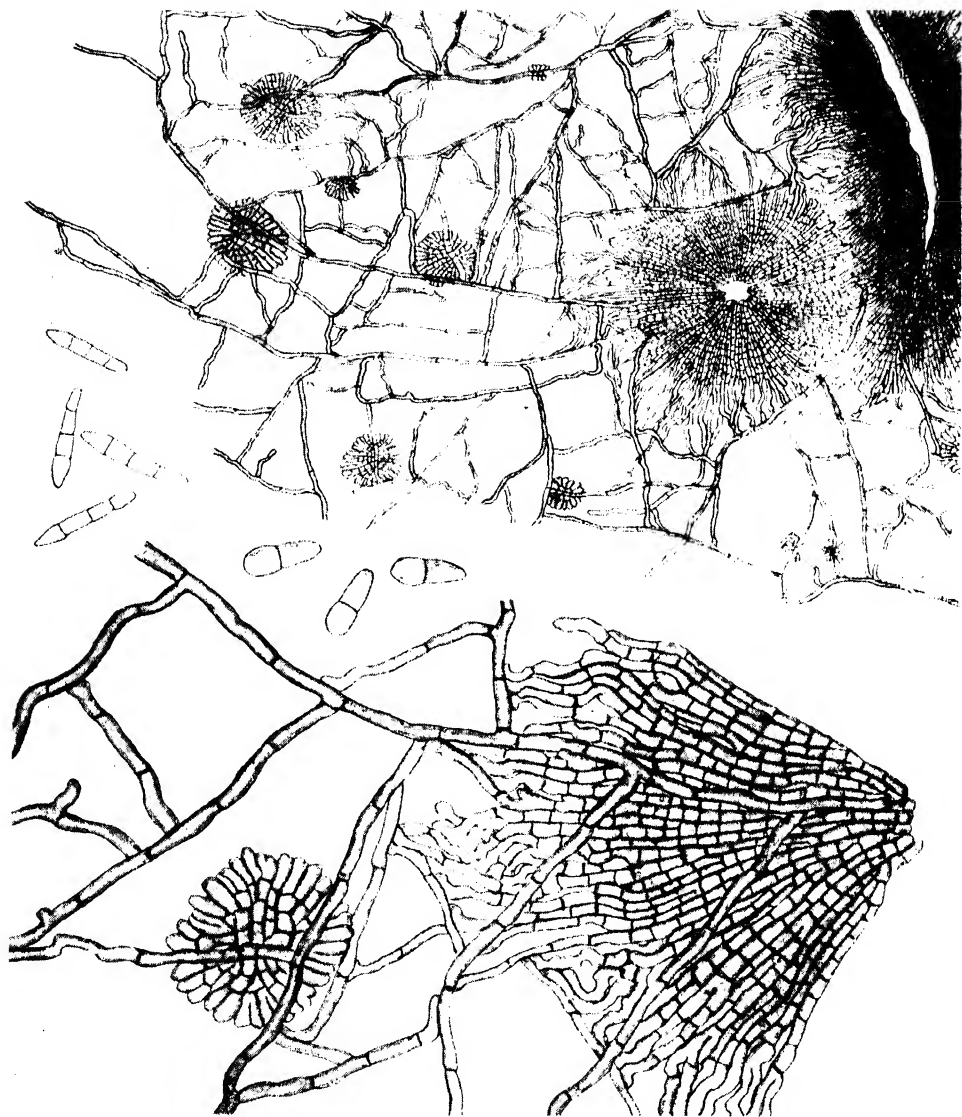


PLATE LXXII.
Echinodes Acokantherae.

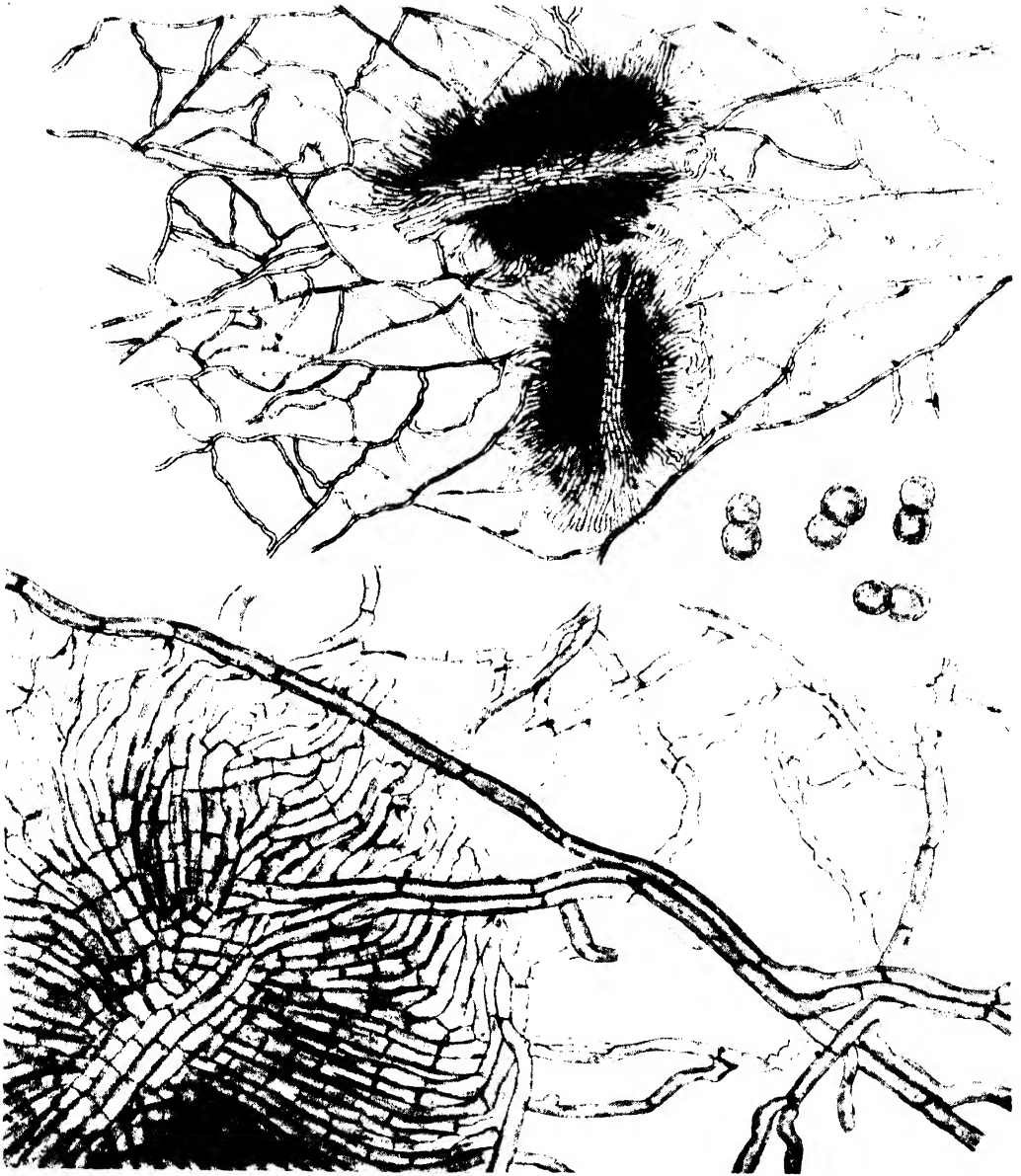


PLATE LXXIII.
Echidnodes rhoina.



PLATE LXXIV.
Echidnodes natalensis.

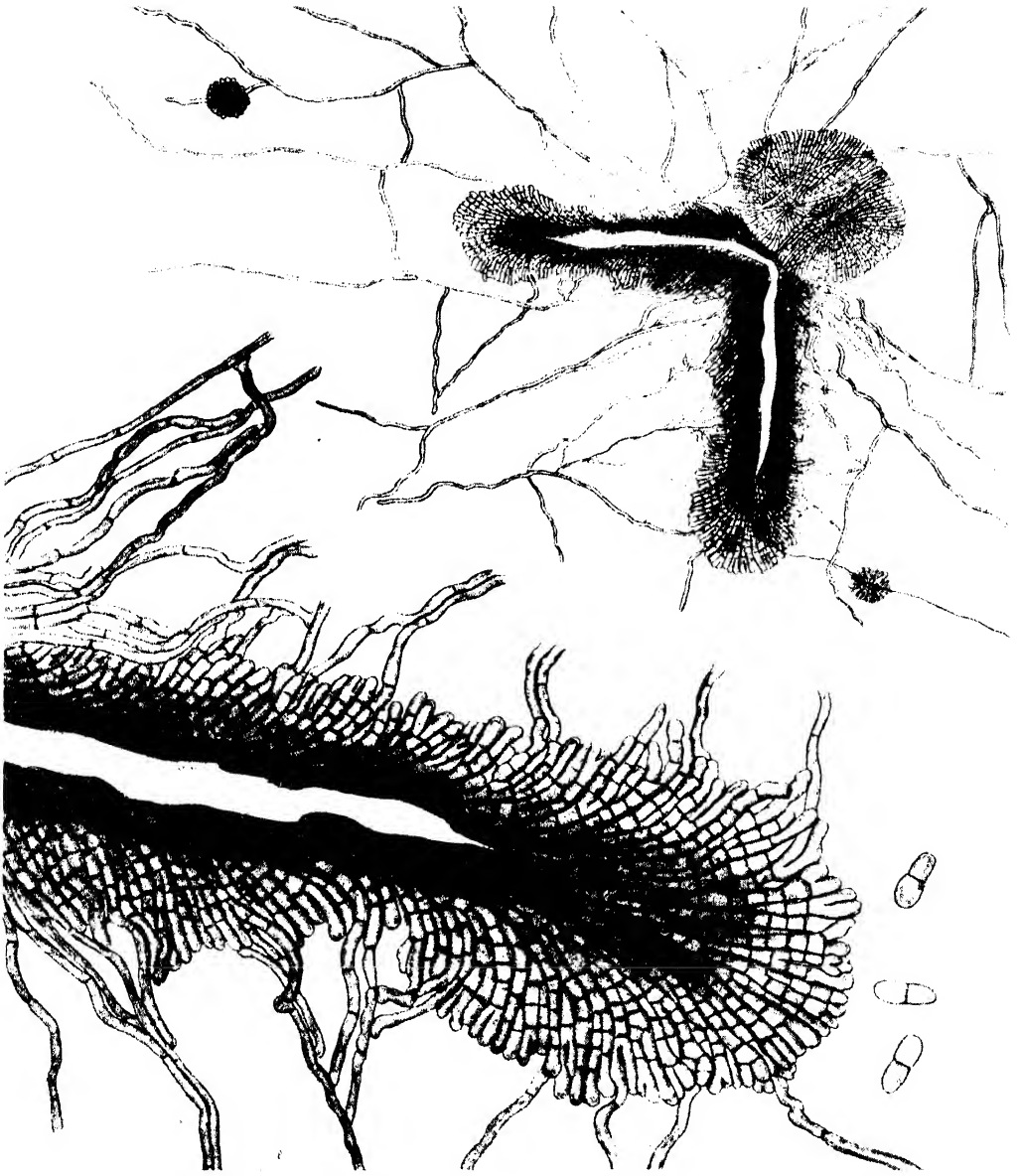


PLATE LVV.
Ecladnoides africana.

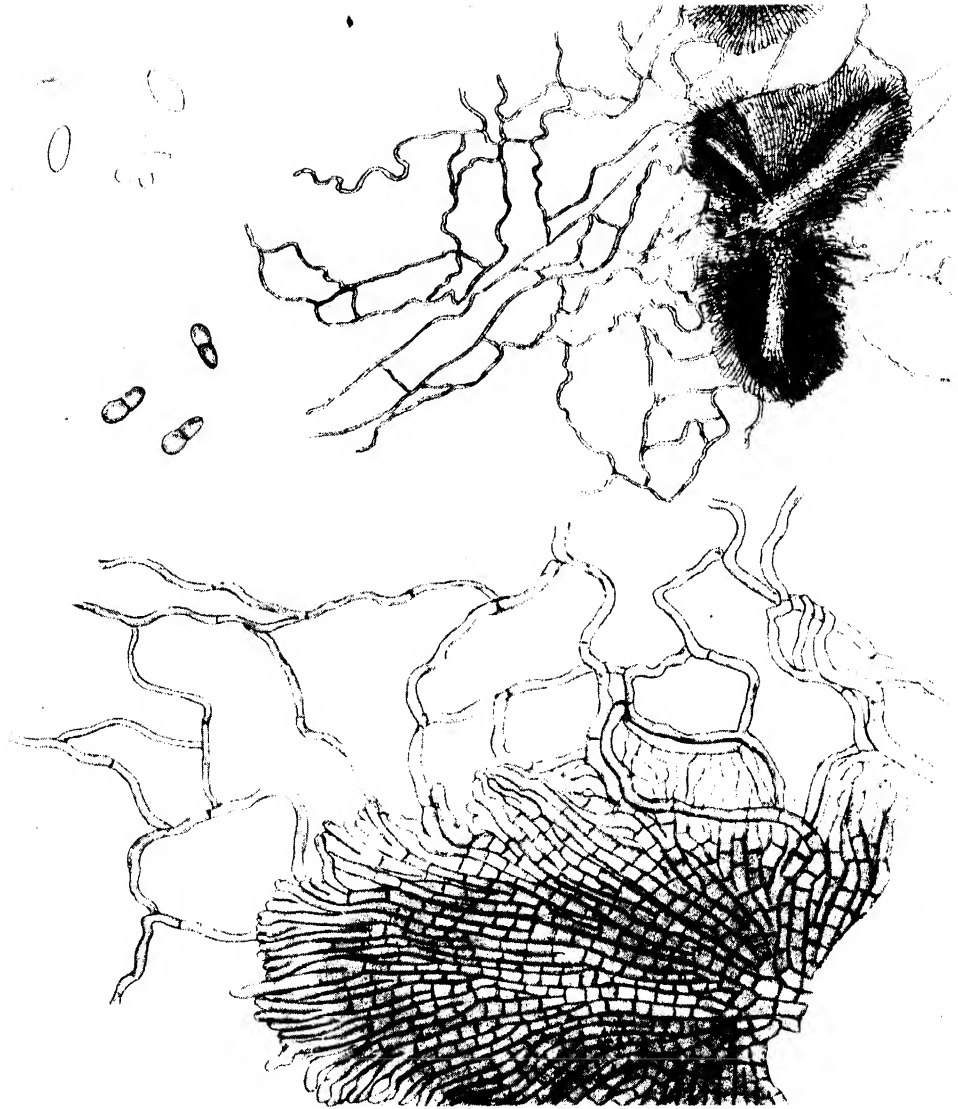


PLATE LXXVI.
Echidnodes Hypolepidis.

REVISED DESCRIPTIONS OF SOUTH AFRICAN SPECIES OF PHYLLACHORA AND RELATED GENERA.

By Ethel M. Doidge.

In their work on the *Dothideaceae* (7) Theissen and Sydow included in this group the families *Polystomellaceae*, *Dothideaceae* and *Montagnellaceae*. In contrast to the erumpent *Dothideaceae*, the *Phyllachoraceae* comprised forms which remain covered by the matrix and three natural sub-families were distinguished, characterised by the position of the stroma: The *Trabutiineae*, between the cuticle and the epidermis, the *Scirrhiineae* between the epidermis and the palisade cells or equivalent subepidermal layer and the *Phyllachorineae* in the mesophyll. The family was characterised as follows:—

Phyllachoraceae Theiss. et Syd.

Stroma under the cuticle or epidermis, remaining covered, with cuticular or epidermal clypeus, prosenchymatous-dothideoid in structure or more or less regularly hyphal. Loculi sunk in the stroma or leaf tissue, merging with the clypeus at the apex.

Within the three sub-families mentioned above, the genera were classified according to the colour and septation of the spores and the presence or absence of paraphyses.

In 1924, after a detailed study of *Phyllachora graminis* on *Agropyrum repens*, Petrak (3) came to the conclusion that *Phyllachora* cannot be regarded as a dothideal form; he pointed out the great similarity between *Phyllachora graminis* and *Physalosporina Astragali*, the only difference being in the colour and consistency of the stroma and of the perithecial membrane. In *Phyllachora* the stroma becomes thickened in the epidermis on either side of the leaf into a black, intra-epidermal clypeus which does not stain blue with iodine; the stroma tissue in many species becomes more or less brittle with age and the perithecial wall is often rather weakly membranous, but never fleshy. In *Physalosporina*, the stroma tissue under the epidermis becomes more or less coloured but is never dark, it forms no clypeus and stains blue black with iodine; the perithecial wall is more or less gelatinous and fleshy. Petrak considers that *Polystigma*, *Physalosporina* and *Phyllachora* are closely related genera which form a natural family. *Phyllachora* is not closely related to the true dothideal fungi.

A few months later, Orton (2) published the result of his studies of the development of *Phyllachora graminis* on *Agropyrum repens*. He also came to the conclusion that *Phyllachora graminis* cannot be considered a dothideaceous fungus, but must be regarded as a reduced type of *Sphaeriaceae*. He was of the opinion, however, that this fungus does not develop a true stroma; there is a progressive development of individual ascocarps within, any infected host area; the clypeus is clearly a special structure, its function being apparently that of a protective membrane.

The subdivision of the *Phyllachoraceae* on the basis of the position of the stroma, Petrak (4) regards as purely artificial. In the characterisation of the genus *Catacauma* of the sub-family *Scirrhiineae*, it is stated that the stroma develops between the epidermis and the sub-epidermal layers of cells. This is only true in a limited sense; the perithecia develop under the epidermis and between them there is connecting stroma, but, in addition hyphae push into the mesophyll more or less freely and may extend to the opposite side of the leaf and develop a rudimentary clypeus in the epidermis.

Petrak is of the opinion that the position of the perithecia is correlated with the texture of the leaf in which the fungus grows. Most *Catacauma* spp. occur on leaves which are more or less hard or leathery, e.g. those of *Ficus* spp.; in such leaves penetration into deeper cell layers is difficult and the perithecia develop under the epidermis. He has no doubt that all, or most of the *Catacauma* forms have been derived and modified from different species of *Phyllachora* and are more closely related to such *Phyllachora* spp. than to other *Catacauma* forms. *Catacauma* is therefore untenable as a genus and must be included in *Phyllachora*.

Trabutia, which was made by Theissen and Sydow the type genus of the sub-family *Trabutiineae*, is a mixed genus. Petrak (5) finds that the type species, *Trabutia quercina*, is a true dothideaceous fungus, and he mentions several other species which are similar in structure. All other species known to him, including some South African forms occurring on *Ficus*, are not dothideal but sphaerial in structure and none other than subcuticular *Phyllachora* spp.

With reference to the characterisation of genera "with" or "without paraphyses", Petrak points out that all true *Phyllachoraceae* have paraphyses, even if these are transitory, reduced, or early dissolve into mucilage. The presence or absence of paraphyses in mature perithecia cannot therefore be maintained as a generic distinction.

Of the generic distinctions employed by Theissen and Sydow (7) there remain only to be considered the colour and septation of the spores. Petrak (3) states that in most species of *Phyllachora* the spores are at first hyaline but become more or less yellowish or yellowish brown when fully mature. It is true that with age the spores develop a pale yellowish brown or bronze tinge, but this differs from the definite snuff brown or olive brown pigmentation of the spores found in some other genera; this pigmentation develops early in the maturing spores and the difference between this and the tinting in old *Phyllachora* spores appears to be more than one of degree.

Of the fungi assigned to genera characterised by the brown colour of the spores, the type species of *Sphaerodothis*, *Sph. Arengae* (Rac.) Shear, has pale tinted spores which do not differ from fully mature or old *Phyllachora* spores. *Phaeochora Neowashingtoniae* (Shear) Th. et Syd. has large, elongated, definitely brown spores and those of *Phaeochorella Parinari* (P. Henn.) Th. et Syd., a South African fungus, are smaller, oblong, snuff brown to olive brown with a medial, hyaline band. In Theissen and Sydow's key, *Phaeochorella* is separated from *Phaeochora* only by the presence of paraphyses, said to be lacking in *Phaeochora*. Until further studies have been made, however, the generic name *Phaeochorella* will be retained for the South African fungus.

Of the genera with 2-celled, hyaline spores, South African species of *Endodothella*, with *Phyllachora*-like stroma have been described. If there is no difference between this genus and *Placostroma* with *Catacauma*-like stroma besides the position of the perithecia, the species of *Endodothella* should fall into the genus *Placostroma* which has precedence; Clements and Shear (1) consider *Endodothella* a synonym for *Placostroma*. In recent mycological literature, however, the genus *Endodothella* has been retained and no change has therefore been made in the nomenclature of the South African species.

Of the 70 South African species described in the following pages, 64 belong to the genus *Phyllachora*, including forms previously described as *Catacauma* or *Trabutia*. There is one species of *Diachora*, a genus with 1-celled, hyaline spores of which the systematic position is ambiguous and of which a detailed generic description is given. The remaining 5 fungi are forms with *Phyllachora*-like stroma and perithecia, differing only in the colour, form and septation of the spores. Until further and more comprehensive studies have been made of *Phyllachora*-like genera which differ in spore characters, these genera may be distinguished as follows:—

A.—Spores ellipsoid or oblong.

(a) Spores 1-celled.

1. Spores hyaline or slightly tinted..... *Phyllachora*.

2. Spores definitely brown..... *Phaeochorella*.

(b) Spores 2-celled, hyaline..... *Endodothella*.

B.—Spores filiform..... *Ophiodothella*.

In the following pages, the species of *Phyllachora* are grouped according to the family of the host plant. The families are in the sequence found in "The Genera of South African Flowering Plants", by Dr. E. P. Phillips (6), which is based on Engler's system of classification.

I am indebted to Dr. H. Sydow for help with some of the critical species and for verifying some of the identifications by comparison with the type specimens to which he has access. I am also indebted to my colleagues in the Phanerogamic herbarium for revising the nomenclature of the host plants, particularly to Miss I. C. Verdoorn and Miss H. Forbes, who examined the Dicotyledons, and to Miss L. C. Chippindall, who identified all the grasses.

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PHYLLACHORA Nke.

On CRYPTOGRAMS.

Phyllachora Hieronymi P. Henn.

Pilze Ostafr. apud A. Engler, Die Pflanzenwelt Ostafrikas (1895) p. 34; Theiss. and Syd., Ann. Myc. 13 (1915) p. 438; Doidge, Bothalia I (1921) p. 28.

Stromata epiphyllous, grouped on indeterminate, yellowish brown leaf spots, convex, shining black, more or less circular in outline, 0.4–0.5 mm. diam.; usually in irregular groups, which are frequently elongated along the veins, occasionally dendritic; visible also on the under side of the leaf, where they are more or less convex and usually dull black.

Clypeus well developed in the upper epidermis, 30–33 μ thick, composed of subopaque, blackish brown hyphae 3–5 μ thick. In the lower epidermis the clypeus is short and ca. 20 μ thick. When the base of the perithecium does not quite reach the lower clypeus, the intervening space is filled with brown stromatic tissue.

Perithecia usually solitary, but occasionally a few are crowded together under one clypeus, globose or flattened globose, usually occupying the whole thickness of the leaf, 250–350 μ diam., 180–250 μ high. Perithecial wall not well defined, pale brown, concentric fibrose, merging above and below with the clypeus; when two perithecia are in contact, the common wall is dark brown, firm and ca. 10 μ thick. Ostiole flat, papilliform, completely immersed in the clypeus, with rather short, hyaline periphyses. Asci numerous, 8-spored, cylindrical or cylindrical-clavate, rounded above, attenuated below to a short stalk, 65–70 \times 16–20 μ . Spores obliquely monostichous or incompletely distichous, 1-celled, hyaline, oblong-ellipsoid, tapering slightly to rounded ends, 20–24 \times 6–8 μ . paraphyses numerous, very fine, filamentous, ca. 1 μ thick.

On *Cyathea Dreyei* O. Kze., on leaves, Winter's Kloof, Natal, Doidge, 1666.

On GRAMINEAE: Tribe ANDROPOGONEAE.

Phyllachora Chrysopogonis Syd.

Bothalia I (1924) p. 219.

Stromata amphigenous, not on leaf spots, more or less evenly distributed over the leaf surface; the tissues of the host in the vicinity of the stromata are somewhat discoloured and the leaf early becomes light brown and dry. Stromata usually discrete, rarely confluent, rather dull black, elliptic, $\frac{1}{2}$ –1 mm. long, slightly convex.

Clypeus usually only in the epidermis over the perithecia and not extending much beyond them, black, opaque, 15–25 μ thick; occasionally there are traces of clypeus formation in the opposite epidermis. At the margin of the stroma, the perithecia are surrounded by stromatic tissue consisting of dark brown, septate hyphae 1.5–4 μ thick, which may be quite loosely and irregularly branched and interwoven, or more or less compact, erect, prosenchymatous.

Perithecia 1–4 in each stroma, usually closely crowded and occupying half to two-thirds of the thickness of the leaf, ellipsoid to lenticular, 300–420 μ diam., 100–170 μ high. Perithecial wall brown, well developed at the sides, 15–20 μ thick, less sharply defined and paler at the base, where it presses against the cells of the host, concentric fibrose, composed of delicate hyphae 1–1.5 μ thick. Asci copiously paraphysate, 8-spored, cylindrical, 65–85 \times 10–14 μ . Spores usually monostichous, oblong, broadly rounded at both ends, continuous, hyaline, 12–15 \times 7–8 μ .

On *Chrysopogon montanus* Trin. var. *tremulus* Stapf, on leaves and sheaths, Vryburg, Pole Evans, 9302.

Phyllachora Doidgeae Syd.

Bothalia I (1924) p. 220.

Stromata amphigenous, not on leaf spots, but with some indefinite yellowish brown or reddish brown discoloration of the leaf tissues in the immediate vicinity, scattered irregularly or in short series, discrete, elliptic, $\frac{1}{2}$ –1 mm. long, dull black, slightly convex, often visible but less conspicuous on the opposite side of the leaf.

Clypeus well developed in the epidermis over the perithecia and not extending beyond them, 30–40 μ thick, composed of subopaque, blackish brown hyphae 2.5–4 μ thick; not so extensive, less dense and 10–20 μ thick in the opposite epidermis. When the base of the perithecium does not reach the epidermis, the intervening cells of the host are filled with closely cellular, hyaline or light brown fungous tissue, which sometimes extends laterally beyond the perithecium.

Perithecia 1-4 in each stroma, deeply immersed, flattened-globose to lenticular, 300-500 μ diam., 200-300 μ high. Perithecial wall 10-15 μ thick, concentric fibrose, composed of rather delicate, pale or darker brown hyphae 2-2.5 μ thick. Ostiole flat, obtusely conical, completely immersed in the clypeus, traversed by a pore 25-30 μ broad. Asci 8-spored, cylindrical, 80-100 \times 12-16 μ . Spores obliquely or transversely monostichous or incompletely distichous, oblong, broadly rounded at both ends, continuous, hyaline 14-18 \times 8-10 μ . Paraphyses numerous, filamentous, exceeding the asci.

Conidiferous loculi present in the same stromata, similar to the perithecia but usually smaller, 175-250 μ diam., 140-170 μ high. Conidia oblong or oblong-fusoid, obtuse at both ends or tapering somewhat, continuous, pale fuscous, 8-12 \times 2-3 μ . Basidia none.

On *Monocymbium ceresiiforme* Stapf (= *Andropogon cerasiaeforme* Nees) Durban, Doidge, 1612, Type; Edendale, Doidge, 1998; Nelspruit, Liebenberg, 26036; Godwan River, Liebenberg, 26055.

Cymbopogon marginatus (Steud.) Stapf, Donkerpoort, Doidge and Bottomley, 29744; Derdepoort, Doidge and Bottomley, 29800.

Hyparrhenia cymbaria Stapf, Schagen, Liebenberg, 29869.

Hyparrhenia hirta Stapf, Debbe's Ravine, Pretoria District, Mogg, 29852; Skinner's Court, Pretoria, Doidge, 23425; Derdepoort, Doidge and Bottomley, 29801; Mamathes, Basutoland, Hean, 32427; Taylor's, near Maritzburg, Doidge, 32785.

A form on *Cymbopogon excavatus* Stapf, which is probably only a variation of *Phyllachora Doidgeae* Syd., may be described as follows:—

Stromata epiphyllous, on definite brown leaf spots, penetrating more or less to the under side of the leaf, scattered or in small groups or series, dull black, raised, oval to linear, $\frac{1}{2}$ -4 mm. long and up to 1 mm. broad.

Clypeus extensive in the upper epidermis, dense black, 25-37.5 μ thick; poorly developed in the lower epidermis. The space between the base of the perithecia and the lower clypeus is filled with pale brown, closely parenchymatous stromatic tissue, which often extends laterally beyond the clypeus and is connected with adjacent stromata; it is most compact in the epidermal cells.

Perithecia numerous, deeply immersed, lenticular to irregularly spherical, 100-500 μ diam., 150-200 μ high. Perithecial wall 10-20 μ thick, concentric fibrose, consisting of light brown, delicate hyphae 1-1.5 μ thick. Asci numerous, 8-spored, cylindrical, 100-125 \times 11-15 μ . Spores directly or obliquely monostichous, 1-celled, hyaline, ellipsoid to oval, broadly rounded at both ends, 12-15 \times 6-9 μ . Paraphyses numerous, exceeding the asci.

On *Cymbopogon excavatus* Stapf, Derdepoort, Doidge and Bottomley, 29805; Schagen, Liebenberg, 29856.

Phyllachora Doidgeae is often parasitised. Several parasitic forms were found, especially on No. 29744; on this collection *Cryptodidymosphaeria clandestina* Syd. was particularly well developed, and in this collection were also found two fungi imperfecti, *Coniothyrium occultum* Syd. and *Staganospora cryptogea* Syd. The host of *Pleospora Doidgeae* Petr. is also probably this species.

***Phyllachora Elyonuri* Doidge nov. spec.**

Stromata epiphylla, sine maculis, sparsa vel gregaria, saepe breviter seriata, atra, oblonga, 0.3-1 mm. longa, $\frac{1}{4}$ - $\frac{1}{2}$ mm. lata, confluyendo etiam longiora, usque 2 mm., vix nitidula; clypeo epidermali bene evoluto in epiphylllo, usque 37.5 μ crasso, carbonaceo, parenchymatice contexto, atro-brunneo, in hypophyllo haud vel parce evoluto praedita; stromate in mesophyllo ex hyphis tenuibus plectenchymatice contextis composito. Perithecia pauca usque numerosa in quoque stromate, $\frac{1}{2}$ vel $\frac{3}{4}$ folii crassitudinis occupantia, applanato-globosa v. e mutua pressione irregularia, 150-300 μ diam., in centro stromatis usque 150 μ , prope marginem 100 μ alta; ostiolo plano papilliformi clypeo immerso praedita; pariete perithecii ca 6-10 μ crasso, concentric fibroso. Asci copiose paraphysati, 8-sporei, cylindracei v. cylindrico-clavati, 70-87.5 \times 11-15 μ . Sporae obliquae, vel transverse monostichae, subinde fere distichae, hyalinae, continuae, ellipsoideae, 7.5-11 \times 6-7.5 μ .

Hab. in foliis *Elyonuri glabri* var. *villosi*, Donkerpoort, prope Pretoria, leg Doidge et Bottomley, 29748.

Stromata epiphyllous, not on leaf spots, scattered, in short series or irregularly grouped, oblong, black, somewhat shining and convex, 0.3-1 mm. long, 0.25-0.5 mm. broad, often becoming confluent in short series and forming compound stromata up to 2 mm. long.

Clypeus usually well developed in the upper epidermis, black, opaque, carbonaceous, variable in thickness, up to 37.5 μ thick between the perithecia, ca. 15 μ thick near the

ostioles; sometimes less dense and opaque, composed of small, dark brown parenchymatous cells, or interrupted by lacunae filled with rather loosely interwoven hyphae. The cuticle is usually not involved and can be seen covering the clypeus. Clypeus absent from the lower epidermis or comparatively poorly developed. The stroma between and below the perithecia consists of light brown hyphae, more or less closely interwoven, which become paler and subhyaline as they penetrate into the mesophyll at the base of the perithecia.

Perithecia few (2 or more) in simple stromata, numerous (up to 14 observed) in compound stromata, occupying half to three-quarters of the thickness of the leaf, monostichous, flattened globose, or, when closely crowded, sometimes becoming irregular and subdistichous, 150–300 μ diam., up to 150 μ high in the centre of the stroma and 100 μ near the margins. Perithecial wall concentric fibrose, 6–10 μ thick, formed of light brown hyphae ca. 1.5 μ thick. Ostiole flat, papilliform, completely immersed in the clypeus, with a pore ca. 20 μ diam. Asci copiously paraphysate, 8-spored, cylindrical or cylindrical-clavate, 70–87.5 \times 11–15 μ . Spores obliquely or transversely monostichous, occasionally subdistichous, continuous, hyaline, ellipsoid, 7.5–11.5 \times 6–7.5 μ .

On *Elyonurus glaber* Phillips var. *villosus* Phill., on leaves, Donkerpoort, Pretoria District, Doidge and Bottomley, 29748.

Elyonurus argenteus Nees, Donkerpoort, Doidge and Bottomley, 30076.

Phyllachora Bottomleyae Doidge nov. spec.

Stromata sine maculis sed fere semper decolorationes rufo-brunneolas efficientia, laxa sparsa vel in greges laxos vel subdensos, elliptica, minuta, usque 1 mm. longa, confluyendo etiam majora; clypeo tantum in epiphylo bene evoluto, atro-brunneo, opaco, usque ad 50 μ crasso, microparenchymatico. Perithecia complura, depresso-globosa vel late ellipsoidea, 180–350 μ diam., 100–180 μ alta, ostiolo plano, papilliformi periphysato, clypeo omnino immerso praedita; pariete perithecii 8–14 μ crasso, concentric fibroso, pallide brunneo; asci 8-spори, cylindranei, 80–87.5 \times 10–13.5 μ ; sporae oblique monostichae, hyalinae, continuae, ellipsoideae, 9–12.5 \times 5–6.25 μ ; paraphyses hyalinae, filiformes.

Hab. in foliis *Ischaemi arcuati*, Donkerpoort, prope Pretoria, leg. Doidge et Bottomley, 29777.

Not on leaf spots; there is some discoloration of the tissues of the host near the stromata and affected leaves rapidly become reddish brown and dry. Stromata epiphyllous, scattered or in irregular groups of varying size, minute, elliptic, 0.3–1 mm. long, 0.25–0.3 mm. broad, occasionally becoming confluent, convex, dull black.

Clypeus well developed in the upper epidermis, at first golden brown, becoming blackish brown, opaque, up to 50 μ thick and microparenchymatous in structure. Stroma between the perithecia, which are often rather remote from one another, plectenchymatous, consisting of rather loosely interwoven, light brown hyphae, 2.5–4 μ thick; stroma in the mesophyll hyaline, extending beyond the clypeus and to the lower epidermis, where there is often a trace of clypeus formation; this is golden brown to dark brown and is not extensive.

Perithecia several in each stroma, deeply immersed, flattened globose to ellipsoid, 180–350 μ diam., 100–180 μ high. Ostiole flat, papilliform, periphysate, completely immersed in the clypeus and traversed by a pore ca. 20 μ broad. Perithecial wall well developed, 8–14 μ thick, concentric fibrose, composed of delicate, light brown hyphae 1–1.5 μ thick. Asci paraphysate, 8-spored, cylindrical, straight or curved, 80–87.5 \times 10–13.5 μ . Spores obliquely monostichous, hyaline, continuous, ellipsoid, 9–12.5 \times 5–6.25 μ . Paraphyses slender, hyaline, filamentous.

On *Ischaemum arcuatum* Stapf, on leaves, Donkerpoort, Pretoria District, Doidge and Bottomley, 29777, 31010, 31017.

This fungus differs from *Phyllachora Ischaemi* Syd.

Phyllachora Miscanthidii Doidge nov. spec.

Stromata sine maculis, amphigena, sed in epiphylo magis conspicua et magis convexa, opace atra, sparsa, oblonga, 0.5–1 mm. longa, usque 0.5 mm. lata, in utraque pagina clypeo atro, vix vel parum nitidulo 30–40 μ crasso, subcarbonaceo, indistincte parenchymatico praedita. Perithecia 2–3 in quoque stromate, lenticularia v. irregularia, 450–600 μ longa, 150–200 μ alta et lata, ostiola plano, papilliformi, clypeo omnino immersa praedita; pariete perithecii ca. 6–8 μ crasso, concentric fibroso, parce evoluto. Asci 8-spори, paraphysati, cylindranei v. cylindraneo-elliptici, 125–125 \times 17–20 μ , rarissime clavati, ca. 90 μ longi et 30 μ lati, antice rotundati, postice plus minusve attenuati, pedicello mox brevi mox plus

minus elongato, firme crasseque tunicati. Sporae oblique monostichae v. disrichae, ellipsoideae v. subclavatae, utrinque leniter attenuatae, $22-27.5 \times 7.5-10 \mu$; superne obtuse rotundatae, inferne subcuneatae, saepe mucronatae vel in setum usque 8μ longum productae. Conidia simul praesentia, gracillima, continua, varie curvata, filiformia, $20-25 \mu$ longa, ca. 0.5μ tantum crassa.

Hab. in foliis *Miscanthidii Sorghi*, in silvis Xumeni, prope Donnybrook, leg. Doidge, 31011.

Not on leaf spots, but there is some discoloration of the tissues in the vicinity of the stromata, and the leaf finally becomes reddish brown. Stromata visible on both sides of the leaf, but more conspicuous on the upper surface, widely scattered, usually discrete, very rarely becoming confluent, oblong, slightly convex, $0.5-1$ mm. long and $0.3-0.5$ mm. broad, black, somewhat shiny.

Clypeus well developed in the epidermis on both sides of the leaf, dense black, opaque, $30-40 \mu$ thick, indistinctly parenchymatous. When perithecia are not in contact, the intervening space is filled with stromatic tissue consisting of erect, parallel, palisade-like brown hyphae about 2μ thick.

Perithecia 2-3 in each stroma, occupying the whole, or at least three-quarters of the thickness of the mesophyll, lenticular to irregular in longitudinal section, round in transverse section, $450-600 \mu$ long, $150-200 \mu$ high and broad. Ostiole flat, papilliform, completely immersed in the clypeus. Perithecial wall not very well differentiated, $6-8 \mu$ thick, concentric fibrose, formed of rather delicate, light brown hyphae, ca. $1-1.5 \mu$ thick. Asci paraphysate, 8-spored, usually cylindrical or cylindrical-ellipsoid, sometimes tapering somewhat to the rounded apex, narrowed below into a stalk which is usually short but sometimes more elongated, $125-135 \times 17-20 \mu$; occasionally clavate, ca. 90μ long and 30μ broad; with a firm thick wall ca. $2-2.5 \mu$ thick. Spores obliquely monostichous to distichous hyaline, continuous, ellipsoid to ellipsoid-clavate, $22-27.5 \times 7.5-10 \mu$, tapering somewhat to both ends, upper end rounded, lower acute, mucronate or prolonged into a fine bristle up to 8μ long: rarely the spore is broader near the acute end. Paraphyses hyaline, filiform.

Conidia produced in great numbers in the same stromata, hyaline, very slender, filiform, continuous, curved in various ways, $20-25 \mu$ long and ca. 0.5μ thick.

On *Miscanthidium sorghum* (Nees) Phil., on leaves, Xumeni Forest, near Donnybrook, Natal, Doidge, 31011 Type; Kentani, Pegler, 8348, 9169; Gala Bush, near Donnybrook (conidial stage only), Doidge, 31013.

Miscanthidium capense Stapf, Verulam, Natal, James, 32675.

The fungus on *Miscanthidium capense* is old and parasitised, but there is no doubt that it is the same species as on *M. sorghum*.

Phyllachora Schizachyrii Doidge nov. spec.

Stromata sine maculis, decolorationes rufo-brunneas indistincte definitas tantum efficientia, amphigena, plerumque epiphylla, sparsa, saepe aggregata et confluentia, in epiphyllis magis conspicua et magis convexulo prominentia, ovalia, usque ad 2 mm. longa et 1 mm. lata; clypeo in utraque v. unica folii pagina bene evoluto, $12.5-20 \mu$ crasso, atro-brunneo, microparenchymatico praedita. Stromate in mesophyllo ex hyphis $1.5-3 \mu$ crassis laxe reticulato-contextis vel plerumque inter perithecia bene evoluto pellucide brunneo plus minus verticaliter prosenchymatico. Perithecia numerosa, ellipsoidea depresso-globosa v. irregularia, totum vel fere totum spatium inter ambas epidermides occupantia, $150-600 \mu$ lata, $200-350 \mu$ alta; pariete ubique bene evoluto, circiter $8-16 \mu$ crasso, concentric fibroso; ostiolo plano papilliformi, poro ca. 10μ lato aperto. Asci 8-sporei, paraphysati, cylindricei, $75-100 \times 10-12.5 \mu$. Sporae monostichae, hyalinae, continuae, late ellipsoideae, utrinque rotundatae, $10-15 \times 6-7.5 \mu$.

Hab. in foliis *Schizachyrii semiberbis*, Donkerpoort prope Pretoria, leg. Doidge et Bottomley, 29747.

Not on definite leaf spots, but the tissues of the host become discoloured in the vicinity of the stromata and affected leaves early become red and dry. Stromata amphigenous, mostly epiphyllous, scattered or in groups, often numerous and becoming confluent, usually more conspicuous and more convex on the upper than on the lower leaf surface, oval, up to 2 mm. long and 1 mm. broad.

Clypeus well developed in the epidermis over the perithecia; in the opposite epidermis sometimes well developed, sometimes not so well developed and less extensive or even absent. Clypeus formed of small-celled parenchymatous tissue at first light brown, becoming

blackish brown, opaque, $12.5\text{--}20\ \mu$ thick. Stroma in the mesophyll plectenchymatous, consisting of rather loosely interwoven, pale olive brown hyphae $1.5\text{--}3\ \mu$ thick, tending to become more compact and prosenchymatous between the perithecia.

Perithecia few or numerous in each stroma, ellipsoid, flattened globose or irregular, often crowded and compressed laterally, deeply immersed, $150\text{--}600\ \mu$ diam., $200\text{--}350\ \mu$ high. Ostiole flat, papilliform, completely immersed in the clypeus, with a pore ca. $10\ \mu$ broad. Perithecial wall well developed, concentric fibrose, $8\text{--}16\ \mu$ thick, composed of rather delicate, olive brown hyphae, $1.5\text{--}2\ \mu$ thick. Asci paraphysate, 8-spored, cylindrical, $75\text{--}100 \times 10\text{--}12.5\ \mu$. Spores monostichous, broadly ellipsoid, hyaline, continuous, broadly rounded at both ends, $10\text{--}15 \times 6\text{--}7.5\ \mu$. Paraphyses very numerous, filiform.

On *Schizachyrium semiberbe* Nees, on leaves, Donkerpoort, Pretoria District, Doidge and Bottomley, 29747, 29778.

Phyllachora anthistiriicola Syd.

Bothalia I (1924) p. 219.

Not on definite leaf spots, but causing some discoloration of the leaf tissues in the vicinity of the stroma and affected leaves rapidly become brown and dry. Stromata amphigenous but mostly epiphyllous, distributed irregularly over the leaf surface, sometimes scattered, sometimes grouped irregularly, very frequently numerous, crowded and almost covering large areas of the upper leaf surface. Single stromata $0.5\text{--}1\ \text{mm.}$ long, not infrequently becoming confluent, convex on the upper side of the leaf, flat on the lower side and often consisting of only a sterile stroma or an epidermal clypeus.

Clypeus dense black, $20\text{--}30\ \mu$ thick in the epidermis over the perithecia: absent from the opposite epidermis or poorly developed and not continuous.

Perithecia up to 5 in a single stroma, ellipsoid or globose, often crowded and flattened laterally by mutual pressure, $200\text{--}350\ \mu$ diam., $170\text{--}200\ \mu$ high, deeply immersed. Ostiole flat, papilliform, completely immersed in the clypeus, with a pore $20\text{--}25\ \mu$ broad. Perithecial wall $5\text{--}10\ \mu$ thick, concentric fibrose, consisting of rather delicate, light brown hyphae ca. $1.5\ \mu$ thick. Asci paraphysate, cylindrical, 8-spored, $70\text{--}80 \times 12\text{--}16\ \mu$. Spores obliquely or transversely monostichous to distichous, hyaline, continuous, oblong, broadly rounded at both ends, $11\text{--}16 \times 7\text{--}9\ \mu$.

Conidia present in the same stromata, filiform, straight or curved, hyaline, $12\text{--}15 \times 0.5\ \mu$.

On *Themeda triandra* Forsk. (= *Anthistiria imberbis*) Magaliesberg, van der Byl, 2196, Type; Birchleigh, Hean, 30069.

On GRAMINEAE: Tribe ARUNDINELLAE.

Phyllachora Arundinellae Doidge nov. spec.

Stromata sine maculis, decolorationibus angustis brunneolis indefinitis cineta, epiphylla sed in utraque folii pagina visibilia, in greges plus minus elongatas disposita vel densiuscule dispersa, leniter convexula, minutissima, oblonga v. linearia, usque ad $1\ \text{mm.}$ longa; clypeo epiphylllo $15\text{--}45\ \mu$ crasso, plerumque plus minus opace atrobrunneo, ex hyphis olivaceo-brunneis $2.5\text{--}4\ \mu$ latis contexto, in hypophyllo pro ratione parce evoluto et usque $20\ \mu$ crasso, haud continuo: stromata in mesophyllo bene evoluto, ex hyphis reticulato-ramosis hyalinis usque ad $5\ \mu$ crassis composito. Perithecia pauca in quoque stromate, saepe tantum 1 vel 2, interdum usque 5, lenticularia vel ellipsoidea, totam folii crassitudinem occupantia, $160\text{--}320\ \mu$ diam., $100\text{--}120\ \mu$ alta: ostiolo plano papilliformi, clypeo omnino immerso poro valde indistincto praedita: pariete perithecii circiter $6\text{--}12\ \mu$ crasso, concentric fibroso, flavo-brunneo. Asci paraphysati, 8-spори, cylindracei, breviter pedicellati, $60\text{--}80 \times 13\text{--}15\ \mu$. Sporae distichae, hyalinae, continuae, ellipsoideae, utrinque rotundatae, $12.5\text{--}15 \times 5\text{--}6.25\ \mu$.

Hab. in foliis *Arundinellae Ecklonii*, Nelspruit, leg. Liebenberg, 26019.

Not on definite leaf spots, but causing some light brown discoloration of the leaf tissues in the vicinity of the stromata. Stromata in elongated groups or thickly scattered over the whole leaf surface, epiphyllous, visible on both sides of the leaf, dull black, only slightly convex, very minute, oblong to linear, up to $1\ \text{mm.}$ long, only occasionally becoming confluent.

Clypeus in the upper epidermis either well developed, brownish black, opaque, $15\text{--}45\ \mu$ thick, or, in places, less dense and consisting of loosely or closely interwoven, tortuous, olive brown hyphae $2.5\text{--}4\ \mu$ thick, which occasionally only partly fill the large epidermal cells. Clypeus in the lower epidermis, comparatively poorly developed, up to $20\ \mu$ thick.

and not continuous. Stroma in the mesophyll well developed, and rather extensive, hyaline or subhyaline, plectenchymatous, consisting of closely interwoven hyphae up to $5\ \mu$ thick.

Perithecia few in each stroma, often 1-2, less frequently up to 5, lenticular or ellipsoid, sometimes crowded and becoming angular through lateral pressure, occupying the whole thickness of the leaf, $160-320\ \mu$ diam., $100-120\ \mu$ high. Ostiole flat, papilliform, completely immersed in the clypeus, pore ill-defined, often very indistinct, ca. $15-20\ \mu$ broad. Perithecial wall delicate, yellowish brown, concentric fibrose, $6-12\ \mu$ thick. Asci paraphysate, 8-spored, clavate or clavate-cylindrical, with a short stalk, $60-80 \times 13-15\ \mu$. Spores distichous, hyaline, continuous, ellipsoid, rounded at both ends, $12.5-15 \times 5-6.25\ \mu$.

On *Arundinella Ecklonii* Nees, on leaves and sheaths, Nelspruit, *Liebenberg*, 26019, Type; Debbe's Ravine, Pretoria District, *Bottomley*, 29866; Silverton Ridge, *Doidge*, 23422; Rooiwal, Eastern Transvaal, *Bosman*, 29857; Wolwekloof, Pretoria District, *Bottomley*, 32873; Nottingham Road, *McClean*, 32293.

Phyllachora Loudetiae Doidge nov. spec.

Stromata sine maculis, sparsa, in greges minulos vel in series breves longitudinales saepe disposita, amphigena, plerumque epiphylla, et in epiphyllis magis conspicua et magis convexa, minuta, opace atra, oblonga, usque ad $0.5\ \text{mm}$. longa; clypeus in epiphyllis bene evoluto, atro, opaco, carbonaceo, usque $50\ \mu$ crasso, in hypophyllo multo minus evoluto usque $10\ \mu$ crasso; stromate in mesophyllo ex hyphis $1.5-3\ \mu$ latis plectenchymatice contextis, subhyalinis v. olivaceo-brunneis composito. Perithecia plerumque 1-2 in quoque stromate, totam folii crassitudinem occupantia, ellipsoidea v. lenticularia, $270-550\ \mu$ diam., $150-170\ \mu$ alta, ostiolo plano, papilliformi, clypeo omnino immerso, periphysato praedita; pariete perithecii bene evoluto, $6-13\ \mu$ crasso, ex hyphis brunneis $2-2.5\ \mu$ crassis composito. Asci paraphysati, 8-sporei, cylindracei, $70-90 \times 10-12\ \mu$. Sporae oblique v. fere transverse monostichae, hyalinae, continuuae, late ellipsoideae v. subglobosae, $8.5-10.5 \times 7.5-8.5\ \mu$. Hab. in foliis *Loudetiae simplicis*, Donkerpoort, prope Pretoria, leg. Doidge et Bottomley, 29775.

Not on leaf spots, but badly affected leaves early become reddish brown and dry. Stromata amphigenous, mostly epiphyllous, but visible on both sides of the leaf, dull black, minute, scattered, in small groups or short series, oblong, up to $0.5\ \text{mm}$. long, slightly convex and more conspicuous on the upper side of the leaf.

Clypeus well developed in the upper epidermis, black, opaque, up to $50\ \mu$ thick, composed of dark brown, tortuous and closely interwoven hyphae $2-2.5\ \mu$ thick; not so well developed in the lower epidermis, less extensive and about $10\ \mu$ thick; between the perithecia and at the margins of the stroma, stroma consists of loosely reticulate hyphae, hyaline to dark brown, $1.5-3\ \mu$ thick.

Perithecia usually occupying the whole thickness of the leaf, 1-2 in each stroma, rarely more, ellipsoid to lenticular, $270-550\ \mu$ diam., $150-170\ \mu$ high; ostiolo flat, papilliform, periphysate, completely immersed in the clypeus, traversed by a rather indefinite pore ca. $20\ \mu$ broad; perithecial wall well developed and comparatively dark brown, $6-12\ \mu$ thick, composed of rather thin-walled, olive brown hyphae $2-2.5\ \mu$ thick. Asci numerous, paraphysate, 8-spored, cylindrical, thin-walled and disappearing early, $70-90 \times 10-12\ \mu$. Spores obliquely or transversely monostichous, continuous, hyaline, broadly ellipsoid to subglobose, $8.5-10.5 \times 7.5-8.5\ \mu$.

On *Loudetia simplex* (Nees) Hubb., on leaves and sheaths, Donkerpoort, Pretoria District, *Doidge* and *Bottomley*, 29775, 29756.

On GRAMINEAE: Tribe BAMBUSEAE.

Phyllachora permutata Petrak.

Ann. Myc. 25 (1927) pp. 268-270.

As *Telimena Arundinariae* Doidge in *Bothalia* I (1922) p. 69.

Stromata few, widely scattered, or if more numerous, distant from one another, borne singly on yellowish or yellowish brown leaf spots. Leaf spots visible on both sides of the leaf, more or less sharply defined, up to $2\ \text{mm}$. long and $0.5-1\ \text{mm}$. broad, seldom longer. Stroma in the centre of each spot, round, broadly elliptic or somewhat irregular, $300-600\ \mu$ diam., flat or slightly convex on the lower side of the leaf, on the upper side strongly convex, about $250-300\ \mu$ high.

Upper clypeus $30-40\ \mu$ thick, sometimes up to $80\ \mu$ thick at the apex, sharply defined at the edges, composed of blackish brown, opaque, indefinitely cellular tissue; lower clypeus less extensive, comparatively poorly developed and lighter in colour. Stroma in the mesophyll poorly developed, hyaline or subhyaline.

Perithecia single in the smaller stromata, subglobose, 250–400 μ diam.; usually 2 in the larger stromata; ostiole flat, immersed in the clypeus, pore more or less round, not sharply defined, 30–40 μ broad; perithecial wall delicate, concentric fibrose, hyaline or light greyish brown. Asci cylindrical or somewhat fusiform, broadly rounded above, narrowing below into a short, thick stalk, or sessile, rather thin-walled, 8-spored, paraphysate, 90–120 \times 15–23 μ . Spores monostichous, rarely subdistichous, continuous, hyaline, ellipsoid or ovate, straight or slightly curved, 16–25 \times 7.5–9.5 μ . Paraphyses numerous, breaking down early and becoming unrecognisable.

On *Arundinaria tessellata* Munro, on leaves, Goodoo Bush, near Mont-aux-Sources, Natal, Doidge, 14103.

The asci and 4-celled spores described as those of *Telimena Arundinariae* Doidge (l.c.) are probably those of a second fungus parasitic in the stroma of the *Phyllachora* (Petrak l.c.); unfortunately this fungus is poorly developed and the material insufficient for further study. It is possibly a species of *Leptosphaeria*.

On GRAMINEAE: Tribe CHLORIDEAE.

Phyllachora Cynodontis (Sacc.) Niessl.

Not. pyren. p. 54; Syll. Fung. II, p. 602; Theissen and Sydow., Ann. Myc. 13 (1915) p. 447.

Not on leaf spots but causing a slight yellowish brown discoloration of the leaf tissues in the immediate vicinity of the stroma. Stromata visible on both sides of the leaf, but usually more conspicuous and more definitely convex on the upper side, round to angular, scattered, rarely becoming confluent, 0.3–0.5 mm. diam.

Clypeus above the perithecia, usually on the upper side of the leaf, very well developed in the epidermis and the subepidermal cells, opaque, black, usually 30–35 μ thick, occasionally up to 85 μ thick, consisting of tortuously and closely interwoven hyphae 1.5–2.5 μ thick, at first light brown, becoming blackish brown and opaque. In the opposite epidermis, the clypeus may be lacking, poorly developed and limited in extent, or well developed. Between the perithecia, when these are not closely crowded, and at the margin of the stroma, the stroma is prosenchymatous and consists of vertical, parallel brown hyphae about 2 μ thick. Elsewhere in the mesophyll the stroma is plectenchymatous, sparse or well developed, hyaline or light brown and composed of reticulately branched and interwoven hyphae, 1.5–2.5 μ thick.

Perithecia few, usually occupying the whole thickness of the leaf, sometimes not more than half its thickness, particularly when two stromata develop opposite one another; sometimes solitary, ellipsoid, up to 450 μ diam., and 200 μ high; more frequently 2–5 in a stroma, globose, or closely crowded and becoming angular or irregular through mutual pressure, central perithecia 100–200 μ diam., 150–200 μ high, marginal perithecia smaller, ca. 100–120 μ broad and high. Ostiole flat, papilliform, completely immersed in the clypeus, sparsely paraphysate, with a pore 10–15 μ broad; perithecial wall well developed, concentric fibrose, composed of pale or darker brown hyphae 1.5–2 μ thick. Asci paraphysate, cylindrical to clavate, rounded above, sporiferous part 50–60 \times 12–15 μ , narrowed at the base into a stalk which may be short or up to 15 μ long. Spores transversely or obliquely monostichous or incompletely distichous, hyaline, oval-ellipsoid, broadly rounded at both ends, 10–12 \times 5.5–6 μ .

On *Cynodon Dactylon* Pers., on leaves, Pretoria, Burt Dary, 145, 170, Wager, 23423; Groenkloof, Pretoria, Burt Dary, 917; Vereeniging, Burt Dary, 935; Cedara, Natal, Fisher, 1172; Bloemfontein, Potts, 11311; Irene, S. Smuts, 17016; Skinner's Court, Bottomley, 23424; Rietvlei, Pretoria District, Acocks and Murray, 32140; Buffelspoort, Rustenburg District, Bottomley, 25938 and Doidge, 27588; Jacksonstun, Doidge, 32437; Schagen, Liebenberg, 26344; Donkerpoort, near Pretoria, Doidge and Bottomley, 29749; Potchefstroom, Radloff (van der Byl 2100); Tabamhlope, Natal, West, 29956; Nqutu, Zululand, West, 29957; Durban, van der Byl 225, 32455 and McClean, 32294; Brandfort, O.F.S., Verwoerd (van der Byl 2366); Knysna, Bottomley, 31015; Stellenbosch, van der Byl 435; Salisbury, S. Rhodesia, Eyles 5336 (van der Byl 2519).

Cynodon hirsutus Stent, Rhebokkop, Rosendal, O.F.S., Goossens, 28816; Groenkloof, Pretoria, Stent, 24342.

Cynodon incompletus Nees, Pretoria, Pole Evans, 17, 1587.

Cynodon plectostachyum Pilg., Cedara, Staples, 17080.

This is a common and somewhat variable species on *Cynodon* throughout South Africa. Number 29749 is parasitised by *Cryptodidymosphaeria clandestina* Syd.

Phyllachora Cynodontis (Sacc.) Niessl. var. **Chloridis** P. Henn.

Pilz. Ostafrik. (1893) p. 34. Syll. Fung. XIV, p. 673.

Asci oblong or clavate, rounded above, 8-spored, sp. part $40-50 \times 8-12 \mu$, pedicellate. Spores monostichous or subdistichous, ellipsoid, tapering slightly to broadly rounded ends, $8-11 \times 5-6 \mu$.

On *Chloris pycnothrix* Trin., on leaves, without locality, 23467; Swaziland, Burt Davy, 1602.

Chloris gayana Kunth., Durban, van der Byl 797, 31972, van der Byl 226 and Wager, 32416.

This variety was described by Hennings from leaves of a *Chloris* collected in tropical Africa. The type has not been available for comparison, but the South African fungus on *Chloris* resembles *Phyllachora Cynodontis* and has spores similar in size to those of Hennings' variety. The material on *Chloris gayana* is old and badly parasitised.

Verwoerd and du Plessis record *Phyllachora chloridicola* on leaves and stems of a *Chloris* sp., from the Victoria Falls, collected by Eyles (van der Byl 658). I have not had an opportunity of examining this specimen.

Phyllachora Leptocarydii Syd.

Bothalia I (1924) p. 220.

Not on definite leaf spots, but causing a rather conspicuous light brown discoloration of the leaf tissues around the stromata. Stromata epiphyllous, scattered more or less evenly over the leaf surface, round to elliptic or somewhat irregular in outline, $0.3-0.6$ mm. long, dull black, convex on the upper side of the leaf; visible also on the under side of the leaf, but there flat and less conspicuous.

Clypeus well developed in the upper epidermis, very dense black, $20-30 \mu$ thick; occasionally there is also a well developed clypeus in the lower epidermis, but on the lower side it is usually brown, rather poorly developed and limited in extent or not continuous; at first composed of brown hyphae $2.5-3 \mu$ thick, becoming indistinctly parenchymatous; stroma in the mesophyll poorly developed.

Perithecia few, 1-3 in each stroma, deeply immersed, occasionally reaching the lower epidermis, globose, $100-180 \mu$ diam., or ellipsoid, up to 250μ diam. and $90-160 \mu$ high; ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with a pore $15-20 \mu$ broad; perithecial wall light brown, delicate, concentric fibrose, about 10μ thick. Asci paraphysate, 8-spored, cylindrical, $50-60 \times 7-11 \mu$. Spores obliquely monostichous or incompletely distichous, continuous, hyaline, ovate or ellipsoid-ovate, broadly rounded at both ends, $7-10 \times 5-6 \mu$.

On *Leptocarydion Vulpiastrum* Stapf, on leaves, Sydenham, Natal, Franks, 7814.

On GRAMINEAE: Tribe ERAGROSTEAE.

Phyllachora Eragrostidis Doidge nov. spec.

Stromata sine maculis, interdum decoloratione flavo-brunnea circumdata, sparsa vel in greges laxos, minuta, opace atra, leniter convexa, oblonga v. striiformia plerumque $0.25-0.75$ mm. longa, confluyendo etiam majora, in utraque folii pagina vel superne tantum clypeo atro vel atro-brunneo, $20-30 \mu$ crasso, indistincte parenchymatico subcarbonaceo praedita. Perithecia raro singularia, plerumque complura, ellipsoidea v. subglobosa, $150-300 \mu$ diam., $150-180 \mu$ alta, ostiolo plano, papilliformi poro ca. $12-15 \mu$ lato aperto, clypeo omnino immerso praedita; pariete perithecii pallide brunneo, concentric fibroso, $7.5-10 \mu$ crasso. Asci 8-sporei, cylindricei, apice rotundati, breviter stipitati, $80-90 \times 10-12.5 \mu$. Sporae oblique monostichae, ovato-ellipsoideae, antice late rotundatae, postice vix vel parum attenuatae, $12-15 \times 6-7.5 \mu$. Paraphyses paucae, fibrosae.

Hab. in foliis *Eragrostidis curvulae*, Mamathes, Basutoland, leg. Hean, 32428.

Not on leaf spots, but sometimes causing an indistinct, yellowish brown discoloration of the leaf tissues in the neighbourhood of the stromata. Stromata scattered or more or less grouped, minute, dull black, slightly convex, oblong to linear, mostly $\frac{1}{4}-\frac{1}{2}$ mm. long, occasionally confluent and forming striae up to 1.5 mm. long.

Clypeus usually well developed on either side of the leaf, occasionally poorly developed or wanting in the lower epidermis, black, opaque, or olive brown, indistinctly parenchymatous, $20-30 \mu$ thick; stroma in the mesophyll rather inconspicuous, composed of fine, hyaline hyphae which penetrate into the cells of the host at the margin of the stroma.

Perithecia solitary or several in each stroma, ellipsoid to subglobose, $150-300 \mu$ diam., $150-180 \mu$ high, occasionally lenticular, ca. 350μ diam. and 140μ high, usually occupying the whole thickness of the leaf; ostiole flat, papilliform, completely immersed in the

Clypeus, periphysate, with a circular pore 12–15 μ broad; perithecial wall pale, delicate, concentric fibrose, 7.5–10 μ thick, merging above and below with the clypeus. Asci paraphysate, cylindrical, 8-spored, broadly rounded above, briefly stipitate, 80–90 \times 10–12.5 μ . Spores obliquely monostichous, continuous, hyaline, ovate-ellipsoid, broadly rounded above, often tapering somewhat to the lower end, 12–15 \times 6–7.5 μ . Paraphyses rather sparse, fibrose. Conidia present in the same stromata, hyaline, filiform, more or less curved.

On *Eragrostis curvula* Nees, on leaves, Mamathes, Basutoland, *Hean*, 32428, Type.

Eragrostis gangetica Steud., Donkerpoort, near Pretoria, *Doidge and Bottomley*, 30077.

Eragrostis Lehmanniana Nees, Toowoomba, Warmbaths, 30437.

Eragrostis spp., Irene, S. Smuts, 17014; Jacksonstun, Brits District, K. M. Putterill, 32444.

Phyllachora superba Doidge nov. spec.

Stromata subdense et late dispersa, nonnunquam bina vel complura aggregata et plus minus connata, sine maculis, decolorationibus angustis rufo-brunneolis indefinitis cincta, elliptica v. fusiformia, 1–2 mm. longa et usque ad 1 mm. lata, opace astra; clypeo in utraque folii pagina evoluto, carbonaceo, ca. 10–20 μ crasso, fere opace atro-brunneo, indistincte et minute parenchymatico praedita; stromate in mesophyllo bene evoluto, pellucide olivaceo-brunneo, inter perithecia verticaliter prosenchymatico ex hyphis 2.5–4 μ crassis composito, cetero parenchymatico cellulis 2.5–5 μ diam. Perithecia pauca, raro unica vel numerosa, plus minusve dense stipata, subglobosa v. ovata, 80–250 μ diam., usque ad 250 μ in stromatis centro alta, marginalia minora ca. 150 μ alta; ostiola plano, papilliformi, clypeo omnini immerso, poro rotundato ca. 30 μ lato aperto praedita; pariete perithecii olivaceo-brunneo, e stratis pluribus cellularum indistinctarum composito; asci paraphysati, 8-sporei, cylindracei, breviter pedicellati, 100–112.5 \times 7.5–10 μ ; sporae oblique monostichae, continuae, hyalinae, ellipsoideae, utrinque rotundatae, 11.5–15 \times 5.5–7 μ . Paraphyses numerosae, filiformes, 1–1.5 μ crassae.

Hab. in foliis *Eragrostidis superbae*, Schagen, leg. Liebenberg, 29864.

Stromata conspicuous, visible on both sides on the leaf, not on leaf spots, but usually causing a reddish brown discoloration of the leaf tissues in the immediate vicinity, scattered, occasionally sub-seriate or very numerous and becoming confluent, elliptic to fusiform or irregular in outline, 1–2 mm. long and up to 1 mm. broad, dull black, more or less convex.

The leaf, which is normally 100–120 μ thick, becomes greatly distended, up to 250 or 280 μ thick, in the region of the stromata. Clypeus brown, usually dense in the epidermis on either side of the leaf, indistinctly and minutely parenchymatous, but not sharply differentiated from the well developed stroma in the mesophyll; this is mostly prosenchymatous near the perithecia, consisting of olive brown parallel hyphae 2.5–4 μ thick, elsewhere closely parenchymatous formed of cells 2.5–5 μ diam., becoming paler at the edges of the stroma, where subhyaline hyphae extend into the leaf tissue beyond the clypeus.

Perithecia few, occasionally solitary, or numerous in each stroma, flattened globose to ovate, often flattened laterally by mutual pressure, 80–250 μ diam., up to 250 μ high in the centre of the stroma and 150 μ high at the margin, with base resting on the upper epidermis. Ostiole flat, broadly papillate, completely immersed in the clypeus, periphysate, with a pore ca. 30 μ broad. Perithecial wall olive brown, concentric fibrose, but not clearly defined outwardly from the stroma. Asci paraphysate, 8-spored, cylindrical, rounded at the apex, briefly pedicellate, 100–112.5 \times 7.5–10 μ . Spores obliquely monostichous, continuous, hyaline, ellipsoid, rounded at both ends, 11.5–15 \times 5.5–7 μ . Paraphyses plentiful, hyaline, filiform, 1–1.5 μ thick.

On *Eragrostis superba* Peyr., on leaves, Schagen, Liebenberg, 29864, Type; Pelindaba, Doidge and Bottomley, 29846, 29872; Nelspruit, Liebenberg, 26018.

On GRAMINEAE: Tribe FESTUCEAE.

Phyllachora ?Brachypodii Roum.

Rev. Myc. 1885, p. 170; Theiss. and Syd., Ann. Myc. 13 (1915) p. 445.

Not on definite leaf spots; there is some yellowish brown discoloration of the leaf tissues around the stromata and affected leaves early become brown and dry. Stromata amphigenous, scattered or loosely grouped, usually discrete, rarely becoming confluent, small, black, somewhat shining, convex, elliptic to linear, 0.3–1.3 mm. long, visible on both sides of the leaf.

Clypeus in both upper and lower epidermis, dense, dark olive brown to black, more or less opaque, 15–25 μ thick, indistinctly parenchymatous. Stroma in mesophyll not extensive, poorly developed, consisting of loosely reticulate, hyaline hyphae ca. 1.5 μ thick.

Perithecia 2–7 in each stroma, lenticular, ellipsoid or subglobose, closely crowded, sometimes angular or irregular through mutual pressure, occupying the whole thickness of the leaf, 100–300 μ diam., 50–150 μ high; ostiole flat, papilliform, completely immersed in the clypeus, with a round pore ca. 15 μ broad. Perithecial wall concentric fibrose, delicate, 10–12 μ thick, pale olive brown, common wall between two perithecia usually firmer and darker, consisting of rather delicate hyphae 1–1.5 μ thick. Asci 8-spored, cylindrical, 62.5–80 \times 10–11 μ . Spores obliquely monostichous, broadly ellipsoid to ovate, hyaline, continuous, broadly rounded at both ends, 8–11 \times 5–6.5 μ .

On *Brachypodium flexum* Nees, Xumeni Forest, near Donnybrook, *Morgan and Doidge*, 29824, 31020, 32223, 32772.

The identity of this fungus with *Phyllachora Brachypodii* Roum. is uncertain, as no specimen of the European species on *Brachypodium pinnatum* was available for comparison.

On GRAMINEAE: Tribe PANICEAE.

Phyllachora striatula Theiss. et Syd.

Ann. Myc. 13 (1915) pp. 441–442.

Not on leaf spots; leaf tissues surrounding the stromata become discoloured and affected leaves early become yellowish or reddish brown. Stromata amphigenous, scattered or seriate, striiform, 0.5–1 mm. long, 0.1–0.2 mm. broad, at times only punctiform, dull black, convex; sometimes numerous and becoming confluent.

Clypeus on one side only, in the epidermis and the subepidermal cell over the perithecia, blackish brown to dense black, opaque, ca. 20 μ thick over the apex of the perithecia, up to 40 μ thick between the perithecia, indistinctly parenchymatous. Stroma in the mesophyll inconspicuous, poorly developed, consisting of more or less reticulate, hyaline hyphae, ca. 1.5 μ thick.

Perithecia one or few, rarely more than 3, in each stroma, deeply immersed, ellipsoid to lenticular or subglobose, 150–300 μ diam., 100–150 μ high; ostiole flat, papilliform, completely immersed in the clypeus. Perithecial wall light to dark olive brown, concentric fibrose, 10–15 μ thick, formed of fine hyphae 1–1.5 μ thick. Asci basal and lateral, 8-spored, cylindrical clavate, 70–100 \times 10–15 μ . Spores monostichous to incompletely distichous, ellipsoid, continuous, hyaline, obtuse at both ends, 11–14 \times 7–8 μ . Paraphyses numerous.

Pycnidia similar to the perithecia. Conidia filiform, hyaline, slightly curved, 25–40 μ long and ca. 1 μ broad.

On *Alloteropsis semialata* Hitch. (= *Axonopus semialatus*) Carolina, *Burt Davy*, 483, Type; Garstfontein, *Bosman*, 29863; Hopevale, near Donnybrook, *Doidge*, 32282.

Phyllachora sanguinolenta Theiss. et Syd.

Ann. Myc. 15 (1917) p. 455.

Stromata not on leaf spots, amphigenous, very closely set on both sides of the leaf, black, somewhat shining, convex, round or elliptic, 0.3–1 mm. long, 0.3–0.5 mm. broad, occasionally becoming confluent and forming larger, compound stromata.

Clypeus usually only on one side of the leaf, above the perithecia, blackish brown to black, opaque, 20–25 μ thick, less frequently up to 45 μ thick; sometimes evident in the epidermis below the perithecia, but then comparatively poorly developed. Stroma in the mesophyll sparse, consisting of rather loosely reticulate hyphae 1.5–3 μ thick, light brown between the perithecia, elsewhere hyaline.

Perithecia few or numerous in each stroma, deeply immersed; sometimes stromata develop opposite to one another on either side of the leaf, and the perithecia are apparently biseriate with a clypeus on either side. Perithecia often rather closely crowded, globose to ellipsoid or somewhat angular through mutual lateral pressure, 150–300 μ diam., 120–150 μ high. Ostiole flat, papilliform, completely immersed in the clypeus, with a pore ca. 20 μ broad. Perithecial wall well differentiated, light or darker olive brown, concentric fibrose, 8–10 μ thick, composed of rather delicate hyphae 1.5–2 μ thick. Asci cylindrical, rounded above, briefly pedicellate, 60–75 \times 10–14 μ . Spores transversely or obliquely monostichous, occasionally incompletely distichous, hyaline, continuous, ellipsoid, rounded at both ends, 10–14 \times 7–8 μ . Paraphyses numerous, filiform.

On *Brachiaria brizantha* Stapf, on leaves, Tzaneen, *Doidge*, 20332; Barberton, *Wager*, 26150.

Brachiaria serrata Stapf, Debbe's Ravine, Pretoria District, *Bosman*, 31007.

Urochloa helopus Stapf, Irene, S. Smuts, 17015; Barberton, Mogg, 7806.

Urochloa mosambicensis (Hack.) Dandy, Mazoe, S. Rhodesia, Eyles 3403.

Phyllachora sanguinolenta Th. et Syd. var. *microspora* Th. et Syd.

Ann. Myc. 13 (1915) p. 455; Doidge, Bothalia I (1924) p. 221.

Stromata thickly scattered, elliptic, convex, slightly shining, black, 0.5–1 mm. long. Spores smaller than the type, $7.5-9 \times 5-6 \mu$.

On *Panicum Stappianum* Faure (= *Panicum minus* Stapf), Bloemfontein, Potts, 11307.

Urochloa ?pullulans Stapf, Toowoomba, Warmbaths, 30436.

Phyllachora Digitariae Syd.

Bothalia I (1924) p. 220.

Not on leaf spots, but causing more or less brown discoloration of the leaf tissues around the stromata. Stromata scattered, black, only slightly shining, slightly convex elliptic, 0.3–1 mm. long, rarely becoming confluent and forming larger compound stromata.

Clypeus on both sides of the leaf, usually well developed, blackish brown, opaque, 15–30 μ thick; less frequently, especially in the upper epidermis, not closely compact, consisting of loosely or more closely interwoven, tortuous, olive brown hyphae, 2–5 μ thick, which do not always completely fill the epidermal cells. Stroma in the mesophyll sparse.

Perithecia 1–5 in each stroma, deeply immersed; sometimes stromata develop opposite to one another on either side of the leaf and the perithecia are then apparently irregularly distichous. Perithecia ellipsoid or subglobose, or, when closely crowded, often angular through mutual lateral pressure, 100–250 μ diam., 100–180 μ high; ostiole flat, papilliform, immersed in the clypeus, copiously periphysate, with a round pore 15–20 μ broad. Perithecial wall light golden brown, concentric fibrose, 10–15 μ thick, composed of rather delicate hyphae, 1.5–2 μ thick, Asci cylindrical, briefly stipitate, 50–65 \times 9–14 μ . Spores monostichous or imperfectly distichous, continuous, hyaline, broadly ellipsoid to subglobose, 8–10 \times 7–8 μ . Paraphyses numerous, hyaline.

On *Digitaria Smutsii* Stent, on leaves, Irene, Pretoria District, S. Smuts, 17017, Type.

Digitaria eriantha Steud., Donkerpoort, Pretoria District. Doidge and Bottomley, 29768.

Digitaria eriantha Steud. var. *stolonifera* Stapf, Prinshof, Pretoria, Bottomley, 23876.

Digitaria Pentzii Stent, Ashbury, Doidge and Bottomley, 29782.

Digitaria seriata Stapf, Donkerpoort, Doidge and Bottomley, 29770.

Phyllachora digitaricola Doidge nov. spec.

Stromata sine maculis, amphigena, subinde contraria, sparsa, v. complura aggregata plus minus connata, atra, convexula, haud vel vix nitidula, elliptica v. striiformia, usque 1 mm. longa: in utraque folii pagina vel unica tantum clypeo opace atro-brunnea, 20–30 μ crasso praedita. Perithecia plerumque 1–3, rarius usque 5, plus minusve seriatim disposita, ellipsoidea, subglobose v. irregularia, 180–350 μ diam., 110–230 μ alta, ostiolo plano, papilliformi, clypeo omnino immerso, poro ca. 15 μ lato aperto praedita; pariete perithecii 10–20 μ crasso, concentrice fibroso. Asci numerosi, cylindricei v. cylindriceo-clavati, antice rotundati, postice plus minusve attenuati, breviter stipitati, 8-spori, 60–90 \times 12–15 μ . Sporae oblique monostichae v. subdistichae, continuae, hyalinae, ellipsoideae, utrinque rotundatae, 12–15 \times 6–7.5 μ . Paraphyses numerosae, fibrosae, mox mucosae.

Hab. in foliis *Digitariae Brazzae*, Donkerpoort, prope Pretoria, leg. Doidge et Bottomley, 29776.

Stromata amphigenous, not on leaf spots, sometimes developing opposite to one another at the same point on the leaf, scattered, subseriate or in irregular groups. Individual stromata small, dull black or somewhat shining, convex, elliptic to striiform, up to 1 mm. long, often confluent in irregular groups or forming striae up to 5 mm. long.

Clypeus well developed in the epidermis over the perithecia, blackish brown, opaque, 20–30 μ thick, formed of closely interwoven hyphae which are 2–2.5 μ thick, at first pale, becoming dark olive brown, opaque; clypeus absent from the opposite epidermis, or, if present, less extensive and not so well developed. Stroma in the mesophyll sparse, formed of loosely reticulate, hyaline hyphae.

Perithecia usually 1–3 in each stroma, rarely more than 5, developing between the epidermis and the subepidermal layers of cells, or more deeply seated and sometimes reaching the opposite epidermis, monostichous, or when two stromata develop opposite to one another apparently distichous, ellipsoid or subglobose, sometimes irregular in shape, 180–350 μ diam., 110–230 μ high. Ostiole flat, papilliform, completely immersed in the clypeus, with a pore ca. 15 μ broad. Perithecial wall firm, pale olive brown to dark brown,

concentric fibrose, composed of pale or darker olive brown hyphae $1.5-2\ \mu$ thick. Asci 8-spored, cylindrical or cylindrical-clavate, briefly stipitate, $60-90 \times 12-15\ \mu$. Spores obliquely monostichous or imperfectly distichous, hyaline, continuous, ellipsoid, rounded at both ends, $12-15 \times 6-7.5\ \mu$. Paraphyses numerous, fibrose, breaking down early.

On *Digitaria Brazzae* Stapf, on leaves, Donkerpoort, *Doidge and Bottomley*, 29776, Type.

Digitaria longiflora Pers., Durban, *McClean*, 30093.

Digitaria monodactyla Stapf, Rietvlei, Pretoria District, *Acocks and Murray*, 32139.

Digitaria sanguinalis Scop., Westfalia, Northern Transvaal, *Doidge*, 20329.

Phyllachora melinicola Syd.

Ann. Myc. 22 (1924) p. 429.

Stromata amphigenous, not on leaf spots nor on discoloured parts of the leaf, scattered, discrete, elliptic or elliptic-oblong, $0.5-1\ \text{mm.}$ long, dull black, slightly convex.

Clypeus formed on both sides of the leaf, dark brown to black, opaque, $20-35\ \mu$ thick, indistinctly parenchymatous, or plectenchymatous formed from dark olive brown, tortuously interwoven hyphae, $2.5-4\ \mu$ thick. Stroma around and between the perithecia plectenchymatous, consisting of loosely or closely reticulate, pale to dark olive brown hyphae ca. $1.5\ \mu$ thick; stroma in the mesophyll hyaline, poorly developed.

Perithecia usually 1-3 in each stroma, often developing between the epidermis and the subepidermal layer of cells, but sometimes deeply immersed in the mesophyll and reaching the opposite epidermis, variable in form, usually ellipsoid, globose or irregular, $300-400\ \mu$ diam., $175-300\ \mu$ high; sometimes lenticular and up to $650\ \mu$ diam.; ostiole flat, papilliform, immersed in the clypeus, with a round pore ca. $10\ \mu$ broad. Perithecial wall very distinct, firm, yellowish brown to olive brown, $10-20\ \mu$ thick, concentric fibrose, composed of hyphae $1.5-2\ \mu$ thick. Asci cylindrical or cylindrical-clavate, stipitate, 8-spored, $50-70 \times 14-20\ \mu$. Spores transversely or obliquely monostichous or incompletely distichous, hyaline, continuous, ellipsoid, rounded at both ends, $11-14 \times 8-9\ \mu$. Paraphyses numerous, fibrose.

On *Melinis minutiflora* Beauv. var. *mutica*, Tzaneen, *van der Byl* 1652. 20446 (ex-Herb. Sydow) Type.

Melinis tenuinervis Stapf, Nelspruit, *Liebenberg*, 26037.

Melinis sp., Salisbury, *Eyles*, 15515.

Phyllachora heterospora P. Henn.

apud de Wildeman, Mission E. Laurent, Fasc. IV (1907) p. 362. Syll. Fung. XXII, p. 425. Theissen and Sydow, Ann. Myc. 13 (1915) p. 453. *Doidge*, Bothalia I (1922) p. 68.

Not on leaf spots, but causing some discoloration of the leaf tissues in the immediate vicinity of the stromata and badly affected leaves soon become brown and dry. Stromata amphigenous, sometimes distributed more or less evenly over the leaf surface, but typically in elliptic to linear groups, $5-20\ \text{mm.}$ long and $1-2.5\ \text{mm.}$ broad; these groups are often numerous and sometimes become confluent end to end. Single stromata usually discrete, round to elliptic, black, somewhat shining, convex, $0.3-1\ \text{mm.}$ long and ca. $0.3\ \text{mm.}$ broad.

Clypeus on both sides of the leaf or on only one side, usually dense, brownish black, opaque, $15-30\ \mu$ thick, indistinctly parenchymatous; sometimes, especially in the epidermis below the perithecia, less dense, composed of more or less closely reticulate, pale to dark olive brown, tortuous hyphae, $1.5-2.5\ \mu$ thick, which do not always completely fill the epidermal cells. Stroma in mesophyll not extensive, consisting of hyaline hyphae $1.5-2.5\ \mu$ thick; between the perithecia and at the margin of the stroma the hyphae are pale olive brown, and more or less closely reticulate.

Perithecia occasionally solitary, but usually 4-10 in each stroma, developing between the epidermis and the subepidermal layers of cells or more deeply seated and often reaching the opposite epidermis; not infrequently stromata develop opposite to one another on either side of the leaf. Perithecia crowded, ellipsoid, subglobose or irregular, $180-300\ \mu$, rarely up to $360\ \mu$ diam., $100-160\ \mu$ high. Ostiole flat, papilliform, completely immersed in the clypeus, with a more or less round pore $10-15\ \mu$ broad. Perithecial wall firm, concentric fibrose, composed of pale or darker olive brown hyphae, $1-1.5\ \mu$ thick. Asci 8-spored, cylindrical, $60-80 \times 10-16\ \mu$. Spores usually distichous, continuous, hyaline, ellipsoid, tapering somewhat to rounded ends, $13-17 \times 7-8\ \mu$. Paraphyses numerous, hyaline, filiform.

Conidia present in the same stromata, hyaline, filiform, curved, ca. $15-20\ \mu$ long and $0.5\ \mu$ thick.

On *Panicum maximum* Jacq., on leaves, Somerset East, MacOwan 1319, 20823; Natal, Medley Wood 221; Maritzburg, Pole Evans, 1442; Durban, Doidge, 1611 and Wager, 32720; Barberton, Doidge, 2015 and van der Byl, 5137; Umbelusi, Mozambique, Howard, 664; Nelspruit, Liebenberg, 26007; Mozambique, Howard, 1459; Tzaneen, Doidge, 20321 and van der Byl 1493; Kentani, Pegler, 7773, 9095; Cedara, Staples, 17058 and van der Byl 1113; Buffelspoort, Rustenburg District, Jacot-Guillarmod, 30651; Derdepoort, Pretoria District, Doidge and Bottomley, 29803; Umtentweni, Natal, Porter, 32678.

Panicum deustum Thunb., Umfolosi, Empangeni District, Natal, McClean, 31018; Ndwedwe, Natal, Halse, 30296; Amanzimtoti, Doidge, 30121; Hippo Pool, Pretorius Kop, Kruger National Park, Chippindall, 33148.

This fungus was originally described from leaves of *Panicum maximum*, collected in the Congo. It was, however, recorded from South Africa by Kalchbrenner as early as 1882, under the name *Dothidea graminis* Pers. (Grev. X, p. 146); the two collections mentioned are those of MacOwan (No. 1319) and Medley Wood (No. 221), portions of both these collections are to be found in the Pretoria herbarium and are undoubtedly *Phyllachora heterospora*. This species appears to be very common in South Africa and to occur wherever the host is found.

Cryptodidymosphaeria clandestina Syd. occurs as a parasite in the stromata of the *Phyllachora* in the following numbers: 1442, 1611, 17058. Another fungus, *Coniothyrium occultum* Syd. (Ann. Myc. 35, 1937, p. 281) was described from No. 26096; this is also parasitic in the stromata of *Ph. heterospora*.

***Phyllachora Winkleri* Syd.**

Ann. Myc. 10 (1912) p. 80; Theiss. and Syd., Ann. Myc. 13 (1915) p. 456; Doidge, Bothalia I (1924) p. 220.

Stromata conspicuous on both sides of the leaf, scattered, sometimes numerous and becoming confluent, dull black, often with a rough surface, convex, elliptic or oblong, 0.5–3 mm. long and up to 0.5 mm. broad.

Clypeus well developed in the epidermis on both sides of the leaf, 20–25 μ thick, dark brown, subopaque to opaque black, composed of closely interwoven brown hyphae, 2–2.5 μ thick. Stroma in the mesophyll poorly developed, consisting of loosely reticulate, hyaline or subhyaline hyphae.

Perithecia fairly numerous in each stroma, not closely crowded, usually lying between the upper epidermis and the fibro-vascular bundles, occasionally occupying almost the whole thickness of the leaf. Perithecia ellipsoid to subglobose, 200–250 μ diam., 120–250 μ high; ostiole flat, papilliform, completely immersed in the clypeus, with a round pore 15–20 μ broad. Perithecial wall well differentiated, light olive brown, concentric fibrose, composed of rather delicate hyphae ca. 1.5 μ thick. Asci 8-spored, cylindrical, briefly pedicellate, 80–120 \times 11–16 μ . Spores monostichous, continuous, hyaline, broadly ellipsoid, 14–17 \times 9–12 μ . Paraphyses numerous, hyaline.

Conidia sometimes present, hyaline, filiform, curved.

On *Paspalum scrobiculatum* L., on leaves, Quelimane, Mozambique, Howard, 648; Nelspruit, Liebenberg, 25998, 26062; Ndwedwe, Natal, Halse, 30291.

In the type, collected in tropical Africa, the perithecia are described as being 340 μ diam. and 180–200 μ high, sometimes extended in the direction of the axis of the leaf to 700 μ long. Perithecia in the South African specimens examined did not exceed the measurements given above.

***Phyllachora Penniseti* Syd.**

Ann. Myc. 13 (1915) p. 39; Theiss. and Syd., Ann. Myc. 13 (1915) p. 457; Doidge, Bothalia I (1922) p. 68.

Not on leaf spots and causing very little localised discoloration of the leaf tissues, but when stromata are numerous, the leaves early become brown and dry. Stromata conspicuous on both sides of the leaf, scattered or in groups and more or less seriate, round or oblong, 0.5–1 mm. long, or becoming confluent and forming larger, compound stromata, dense black, slightly convex.

Clypeus usually well developed on either side of the leaf, occasionally wanting or poorly developed in the epidermis below the perithecia, black, opaque, 20–45 μ thick, obscurely parenchymatous. Between the perithecia, the stroma is plectenchymatous, composed of olive brown hyphae 1.5–3 μ thick, usually more or less reticulate, but in places tending to become parallel and loosely prosenchymatous.

Perithecia rather large, one to many in a single stroma, often occupying the whole thickness of the leaf, lenticular to irregular or angular-globose, 280–350 μ diam. or up to 650 μ long, 200–300 μ high; ostiole flat, papilliform, copiously periphysate, completely immersed in the clypeus, with a pore 20–25 μ broad. Perithecial wall light brown, concentric fibrose, 7–10 μ thick, formed of delicate hyphae 2–3 μ thick. Asci 8-spored, clavate, rounded at the apex, 70–95 \times 20–26 μ . Spores distichous or obliquely monostichous, broadly ellipsoid, continuous, hyaline, broadly rounded at both ends, 17–24 \times 11–18 μ . Paraphyses very numerous, fibrose, ca. 1.5 μ thick.

Conidia filiform, continuous, hyaline, straight or flexuous, 18–35 \times 1 μ .

On *Pennisetum macrourum* Trin., on leaves, Hogsback, K. M. Putterill, 30071; Kirstenbosch, Pearson, 7401; Stellenbosch, van der Byl 1921, 2316.

Pennisetum sphacelatum D. et S., Tugela Valley, near Mont-aux-Sources, Natal, Doidge, 14102.

The type specimen of *Phyllachora Penniseti* Syd., on *Pennisetum Benthami* Steud., was collected by Vanderyst in the Congo. Dr. Sydow has a specimen on *Pennisetum purpureum* from Uganda collected by Hansford and one collected by Deighton in Sierra Leone. There is also, in the Pretoria Herbarium, a specimen on *Pennisetum setosum* collected by Dümmer in Uganda.

***Phyllachora Evansii* Syd.**

Ann. Myc. 10 (1912) p. 40; Theissen and Sydow, Ann. Myc. 13 (1915) p. 459; Doidge, Bothalia I (1922) p. 67.

Stromata on definite, light brown leaf spots with a darker brown edge, or not on definite leaf spots but causing some discoloration of the leaf tissues. Stromata smooth, dull black, scattered, in series or in groups, sometimes becoming confluent, visible on both sides of the leaf, but more conspicuous and more convex on the upper side, oblong, 0.5–1 mm. long, 0.3–0.5 mm. broad.

Clypeus usually on both sides of the leaf, but not so well developed nor so extensive and occasionally wanting on the lower side, occupying the epidermal cells and often extending to subepidermal cell layers, formed of closely interwoven brown hyphae, 2–3 μ thick, becoming opaque, very dense black, 20–40 μ thick, occasionally up to 50 μ . Stroma around the perithecia composed of loosely reticulate hyphae, hyaline or pale olive brown, occasionally tending to become vertical and in parallel strands, but not typically prosenchymatous; sparse and poorly developed in the mesophyll.

Perithecia one or few in each stroma, usually occupying the whole thickness of the leaf, ellipsoid to lenticular or irregular in form, 250–500 μ diam., 120–200 μ high; ostiole flat, papilliform, periphysate, completely immersed in the clypeus. Perithecial wall concentric fibrose, 12–15 μ thick, composed of light brown hyphae 1.5–2 μ thick. Asci 8-spored, cylindrical to cylindrical-clavate, rounded at the apex, 70–120 \times 7–12 μ . Spores monostichous to incompletely distichous, hyaline, continuous, ellipsoid to oblong, usually rounded at both ends, but sometimes somewhat drawn out at the lower end, straight, 14–18 \times 6–8 μ . Paraphyses hyaline, filiform, very numerous.

Pycnidia often present in the same stromata; conidia hyaline, filiform, curved in various ways, often falcate, 15–25 \times 1 μ .

On *Setaria sulcata* Raddi (= *S. Chevalieri* Stapf), Barberton, Burtt Davy, 137, 138, Type and Pole Evans, 1280; Isipingo, Bottomley, 11659; Woodbush, Northern Transvaal, Doidge, 17734 and van der Byl 1654; Durban, Bottomley, 12231; Schagen, Liebenberg, 26025; Umtentweni, Natal, Wager, 32672; Umfolosi, McClean, 32307.

Setaria lindenbergiana Stapf, Wonderboom, near Pretoria, Mogg, 23464.

***Phyllachora transvaalensis* Doidge nov. spec.**

Stromata amphigena, subinde contraria, in pagina folii opposita non vel parum visibilia, decolorationibus angustis, flavo-brunneolis indefinitis cincta, elliptica usque linearia 1–2 mm. longa, ca. 0.5 mm. lata, subinde confluyendo longiora, atra, nitidula, convexula. Clypeo in una epidermide plerumque tantum evoluto, in altera deficiente vel tantum parvissime formato, atro, opaca, carbonaceo, usque 50 μ crasso; stromate inter perithecia ex hyphis 1.5–2 μ crassis laxe reticulato-contexto, in mesophyllo parce evoluto. Perithecia 1 vel plura in quoque stromate, quoad formam et magnitudinem ludentia, sive numerosa, et aggregata, ellipsoidea usque subglobosa aut irregularia, pariete communi separata, usque ad 200 μ alta et 100–330 μ lata; sive solitaria et distanter posita, ellipsoidea, 120–200 μ alta et 270–420 μ lata; ostiolo plano papilliformi, clypeo omnino immerso, periphysato

praedita; pariete perithecii olivaceo-brunneo usque obscure brunneo, plerumque 10–15 μ crasso, concentrice fibroso. Asci copiose paraphysati, 8-sporei, cylindracei vel clavati, 62–75 \times 11–16 μ . Sporae recte vel oblique monostichae, in ascis clavatis subinde subdistichae, continuae, hyalinae, subglobose usque late ellipsoideae, 10–12.5 \times 7.5–9 μ .

Hab. in foliis *Setariae flabellatae*, Donkerpoort, prope Pretoria, leg., Doidge et Bottomley, 30090.

Not on definite leaf spots, but stromata surrounded by a yellowish brown zone of discoloured leaf tissue. Stromata amphigenous, sometimes at the same point on the leaf; not visible on the opposite side of the leaf or only faintly so, convex, black, shining, scattered or in groups, elliptic to linear, 1–2 mm. long and about 0.5 mm. broad; occasionally coalescent and forming longer striae.

Clypeus usually well developed, in one epidermis only, black, opaque, carbonaceous, up to 50 μ thick, indistinctly parenchymatous; absent from the opposite epidermis or very poorly developed. Between the perithecia and between the clypeus and the subepidermal cells at the edges of the stroma, is a mass of loosely reticulate hyphae, which are hyaline to pale olivaceous brown and 1.5–2 μ thick; stroma in the mesophyll poorly developed, consisting of a few hyaline hyphae. Perithecia developing between the epidermis and the subepidermal layers of the leaf, one to many in each stroma, irregular in form and size; when numerous and crowded, ellipsoid to subglobose or irregular, 100–350 μ diam., up to 200 μ high in the centre of the stroma and 120 μ high at the margin; when single or widely separated, ellipsoid, 270–420 μ diam., and 120–200 μ high; ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with a more or less round pore 20–25 μ broad. Perithecial wall well defined, olive brown to dark brown, mostly 10–15 μ thick, usually, paler and less clearly defined at the base, where it presses against the cells of the host concentric fibrose, formed of hyphae 1.5–2 μ thick. Asci 8-spored, cylindrical to clavate, 62–75 \times 11–16 μ . Spores monostichous in the cylindrical asci or incompletely distichous in the clavate asci, hyaline, continuous, subglobose to broadly ellipsoid, 10–12.5 \times 7.5–9 μ . Paraphyses numerous, hyaline, fibrose.

Pycnidia often present in the same stromata and interspersed with the perithecia. Conidia filiform, hyaline, straight or somewhat curved, 20–40 \times 1–1.5 μ .

On *Setaria flabellata* Stapf, Donkerpoort, near Pretoria, Doidge and Bottomley, 30090;

Birchleigh, Hean, 30091; Rietvlei, Pretoria District, Acocks and Murray, 32138.

Setaria nigrirostris Dur. et Schinz, Vereeniging, Burt Davy, 10021.

Setaria sphacelata Stapf et Hubb., Garstfontein, Pretoria District, Pienaar, 1265;

Barberton, Doidge, 2012; Donkerpoort, Doidge and Bottomley, 30092.

This fungus differs from *Phyllachora Evansii* Syd. and *Ph. setariaecola* Speg., which also occur on *Setaria* spp. The subglobose ascospores are rather characteristic. The material on *Setaria nigrirostris* and *S. sphacelata* is scanty and rather poor, but is evidently the same species as the one on *S. flabellata*.

Phyllachora Tricholaenae P. Henn.

Engl. bot. Jahrb. XXIII (1897) p. 541; Theiss. and Syd., Ann. Myc. 13 (1915) p. 461.

Not on definite leaf spots, but causing more or less purplish brown or yellowish brown discoloration of the leaf tissues around the stromata. Stromata amphigenous, small, shining black, convex, oblong or elliptic, 0.5–1 mm. long, scattered or in small groups or series and often coalescing to form longer striae up to 5 mm. long; visible, but not so conspicuous, on the opposite side of the leaf, which, in the region of the stromata, becomes distended to about twice its normal thickness.

Clypeus well developed in the epidermis over the perithecia, brownish black to black, opaque, up to 25 μ thick, composed of olive brown, closely interwoven hyphae ca. 2.5 μ thick; in the opposite epidermis not so well developed and less extensive, sometimes reduced to a few small black spots, with some orange red discoloration in the adjacent cells of the host. When the perithecia are not contiguous, the space between them is filled with stroma, consisting of loosely or more closely reticulate, light or dark olive brown hyphae, 1.5–3 μ thick; this is sometimes compact and almost opaque, especially near the clypeus. Stroma elsewhere in the mesophyll poorly developed, consisting of a few hyaline hyphae.

Perithecia up to 7 in each stroma, occupying the whole of the mesophyll between the upper and lower clypeus, or not quite reaching the lower epidermis, globose, flattened globose or irregular, 120–280 μ diam., 100–200 μ high; ostiole flat, papilliform, completely

immersed in the clypeus. Perithecial wall usually pale yellowish brown, 8–15 μ thick, concentric fibrose, consisting of delicate, yellowish or pale olive brown hyphae 2–2.5 μ thick; occasionally, especially the common wall between perithecia, firmer, darker brown and up to 25 μ thick. Asci paraphysate, 8-spored, cylindrical or cylindrical-clavate, briefly stipitate, 67–82.5 \times 12–14 μ . Spores obliquely monostichous or distichous, continuous, hyaline, ellipsoid, broadly rounded at both ends, 11–15 \times 5.5–6.5 μ .

Conidia often present, hyaline, filiform, straight or somewhat curved, continuous, 20–36 μ long, 0.5–0.7 μ broad.

On *Rhynchelytrum repens* (Willd.) Hubb. (= *Tricholaena rosea* Nees), on leaves and sheaths, Godwan River, Liebenberg, 26053; Nelspruit, Liebenberg, 26672; Irene, S. Smuts, 17013; Winkle Spruit, Pole Evans, 5641; Ashbury, Doidge and Bottomley, 29781; Donkerpoort, Pretoria District, Doidge and Bottomley, 29738; Schagen, Liebenberg, 30139; Tzaneen, van der Byl 1657; Durban, van der Byl, 32454; Cavendish, Natal, Wager, 32781.

Tricholaena monachme Trin., Beira, Hitchcock 34384, 33107; Derdepoort, Pretoria District, Doidge and Bottomley, 29796.

In the South African material, the spores are narrower than the measurements given in the original description. The South African specimens were compared by Dr. Sydow with the type, collected on *Tricholaena rosea* in Usambara, and he could find no difference. The tropical fungus is more luxuriantly developed and the stromata are usually more distant in the South African specimens; in *van der Byl* 1657, collected at Tzaneen, however, there is the same luxuriant development as in the type. *Cryptodidymosphaeria clandestina* Syd., was observed parasitic in the stroma of No. 29738.

On GRAMINEAE: Tribe SPOROBOLEAE.

Phyllachora Morganae Doidge nov. spec.

Stromata sine maculis, decolorationibus angustis brunneolis indefinitis cincta, plerumque epiphylla, in pagina contraria plus minus visibilia, opace atra, convexa, elliptica, usque ad 1.5 mm. longa; clypeo bene evoluto, opace atra, carbonaceo, mox 35–58 μ crasso, mox 20 μ crasso, in epidermide opposito minus extenso et parce evoluto. Perithecia in quoque stromate pauca vel numerosa, ellipsoidea vel globosa, pressione saepe irregularia, in parte centrali stromatis 180–200 μ alta et 100–300 μ diam, ad marginem stromatis ellipsoidea usque 320 μ diam. et 100 μ alta; ostiolo plano, papilliformi, omnino immerso praedita; pariete perithecii ca 10–15 μ crasso, brunneo, concentric fibroso; asci 8-sporei, cylindracei vel clavati, saepe supra pedicellum abrupte geniculati, 68–100 \times 13–16 μ , pedicello mox brevi mox plus minus elongato; sporae monostichae vel distichae, ellipsoideae, utrinque, rotundatae v. subacutae, saepe etiam superne rotundatae, inferne subacutae, 15–17.5 \times 7–10 μ . Conidia simul praesentia gracillima, continua, filiformia, 15–23 μ longa, ca. 0.5 μ tantum crassa.

Hab. in foliis *Sporoboli pyramidalis*, in silvis, Xumeni, prope Donnybrook, leg. Morgan et Doidge, 29833.

Stromata mostly epiphyllous, but more or less visible on the opposite side of the leaf, not on leaf spots, but surrounded by a narrow zone of yellow brown, discoloured leaf tissue, dull black, convex, scattered, elliptic, up to 1.5 mm. long, or more or less seriate and becoming confluent in lines up to 5 mm. long.

Clypeus in the epidermis over the perithecia black, opaque, carbonaceous, sometimes well developed, 35–58 μ thick, sometimes only 20 μ thick; on the opposite side of the leaf less extensive and comparatively poorly developed, sometimes lacking. Stroma between and around the perithecia composed of pale olive brown hyphae 1–2 μ thick, which are loosely reticulate or become vertical and form parallel strands, not closely prosenchymatous; elsewhere in the mesophyll stroma development is sparse.

Perithecia deeply immersed, few or many in each stroma, ellipsoid to subglobose or irregular through mutual pressure, 180–200 μ high in the centre of the stroma, 100–300 μ diam.; at the margin of the stroma ellipsoid, up to 320 μ diam. and ca. 100 μ high; ostiolo flat, papilliform, completely immersed in the stroma, with a pore ca. 20 μ broad. Perithecial wall well defined at the sides, brown, firm, concentric fibrose, ca. 10–15 μ thick; at the base, where it presses against the cells of the host, thinner, ca. 7–8 μ , or fused with the lower clypeus. Asci 8-spored, cylindrical to clavate, often bent abruptly just above the stipe, which may be short or prolonged, 68–100 \times 13–16 μ . Spores monostichous to distichous, hyaline, continuous, rounded or subacute at the ends, often rounded above and subacute below, 15–17.5 \times 7–10 μ .

On *Sporobolus pyramidalis* Beauv., on leaves, Xumeni Forest, near Donnybrook, Morgan and Doidge, 29833; Nottingham Road, McClean, 32292.

Sporobolus sp., Donkerpoort, Pretoria District, Doidge and Bottomley, 29772.

So far as can be judged from the descriptions, this fungus differs from *Phyllachora Sporoboli* Pat. from Algiers and from *Ph. sporobolica* Petr. et Cif. collected in Santiago. There has been no opportunity of examining authentic material of either species.

On GRAMINEAE: Tribe ZOYSIAE.

***Phyllachora Perotidis* Doidge nov. spec.**

Stromata plerumque sine maculis typicis sed decoloratione brunnea cincta, in utraque folii pagina visibilia, in epiphyllis plerumque magis conspicua et leniter convexula, sub-circularia vel elliptica aut irregularia, usque ad 0.5 mm. longa, sparsa vel greges minutos formantia; clypeo atro, opaco, in epiphyllis usque 30 μ crasso, in hypophyllis minus evoluto usque 15 μ crasso praedita; perithecia 1-5 in quoque stromate, subglobosa vel ellipsoidea, 120-450 μ diam., 150-200 μ alta, ostiolo papilliformi, poro ca. 15 μ lato aperto, clypeo omnino immerso praedita; pariete perithecii ca. 10 μ crasso, pallide brunneo, concentricae fibroso; asci 8-spori, cylindracei, 60-70 \times 10-11.5 μ ; sporae oblique v. fere transverse monostichae, hyalinae, continuuae, ellipsoideae, 10-12.5 \times 5-7 μ . Paraphyses numerosae, fibrosae.

Hab. in foliis *Perotidis indicae*, Donkerpoort, prope Pretoria. leg. Doidge et Bottomley, 29754.

Stromata occasionally on oval, light brown leaf spots with a darker brown margin, but more frequently surrounded by an indefinite brown zone of discoloured tissue; mostly epiphyllous, usually visible on both sides of the leaf, but more conspicuous and slightly convex on the upper surface, dull black, scattered or in small groups, subcircular to elliptic or irregular in outline and up to 0.5 mm. long.

Clypeus well developed in the upper epidermis, black, opaque, up to 30 μ thick, usually not extending beyond the perithecia, formed of tortuous, olive brown, closely interwoven hyphae, 1.5-2.5 μ thick, becoming parenchymatous; less extensive and up to 15 μ thick, or lacking in the lower epidermis. Stroma in the mesophyll inconspicuous and not extensive, consisting of a few hyaline hyphae. Leaf tissues in the vicinity of young stromata are apparently unaffected, but when the perithecia have discharged their spores, the cells of the leaf under the clypeus become brown and dead and often opaque.

Perithecia one or several, up to 5 in each stroma, developing under the epidermis or more deeply seated and often reaching the lower epidermis, subglobose to ellipsoid, 120-450 μ diam., 150-200 μ high; ostiole flat, papillate, completely immersed in the clypeus, with a pore ca. 15 μ broad. Perithecial wall pale, concentric fibrose, not well defined, ca. 10 μ thick, consisting of delicate hyphae 1.5-2.5 μ thick, outer layers pale olive brown, inner hyaline. Asci 8-spored, cylindrical, 60-70 \times 10-11.5 μ . Spores obliquely or almost transversely monostichous, hyaline continuous, ellipsoid, 10-12.5 \times 5-7 μ . Paraphyses numerous, fibrose, hyaline. Pycnidia often present in the same stromata; conidia filiform hyaline.

On *Perotis indica* (L.) O. Ktze., on leaves, Donkerpoort, Pretoria District, Doidge and Bottomley, 29754; Pretorius Kop, Kruger National Park, Chippindall, 33147.

On MUSACEAE.

***Phyllachora Strelitziae* Sacc. emend. Doidge.**

Syll. Fung. 2 (1883) p. 606.

Dothidea Strelitziae Cke., Grevillea X (1882) p. 129.

Endodothella Strelitziae (Cke.) Theiss. et Syd., Ann. Myc. 13 (1915) p. 587; Doidge,

Bothalia I (1921) p. 31.

Young stromata not on leaf spots, nor causing discoloration of the tissues of the host; older stromata are usually to be found singly or in groups of 2-3, on very definite leaf spots 3-10 mm. long, at first brown, then becoming paler in the centre with a reddish brown border; these spots are visible also on the under side of the leaf.

Stromata epiphyllous, scattered or rather closely crowded and then becoming confluent, round to elliptic in outline, 0.5-2.5 mm. long and 0.5-1 mm. broad, conical, dull black except at the apex, which is shining black around the single, punctiform ostiole; sometimes visible also on the under side of the leaf, where they show as minute, flat or slightly convex, purplish brown to black spots.

Clypeus massive, occupying the upper epidermis and several subepidermal layers of more or less rectangular cells devoid of chlorophyll, opaque, black, carbonaceous, usually 75–80 μ thick, sometimes up to 100 μ thick, microparenchymatous in structure, formed of rather thick-walled, dark olive brown, irregular cells, 4–6 μ diam. Stroma round the perithecia is light brown to purplish brown, prosenchymatous, formed of vertical, thin-walled hyphae, mostly 4–6 μ thick and filling the space between the arched clypeus and the mesophyll of the leaf. Stroma poorly developed in the mesophyll, consisting of hyaline hyphae, more or less closely reticulate and interwoven; often extending to the lower epidermis where a clypeus is formed, shorter than on the upper side, comparatively poorly developed and often not continuous; sometimes there is some sterile prosenchymatous stroma under this lower clypeus, to a depth of 50 μ .

The large, solitary perithecium is usually seated on the palisade cells of the leaf and is covered by the arched clypeus; it is lenticular, 550–850 μ diam., 200–300 μ high; ostiole flat, completely immersed in the clypeus, opening by a broadly funnel-shaped pore, ca. 25 μ broad at the base and 50 μ at the apex, periphyses rather sparse. Perithecial wall well defined, ca. 10 μ thick at the base, where it is closely appressed to the cells of the leaf, 15–20 μ thick at the sides, merging above with the clypeus, concentric fibrose, composed of rather delicate, thin-walled hyphae 2.5–3 μ thick, outer layers olive brown, inner hyaline. Asci 8-spored, cylindrical, rounded above, tapering below to a short foot, 130–165 \times 20–30 μ . Spores monostichous or incompletely distichous, hyaline, continuous, globose to broadly ellipsoid, 9–16 \times 10–12.5 μ ; apparently remote from one another in the ascus, each spore being surrounded by a mucilaginous sheath 4–4.5 μ thick. Paraphyses numerous, filamentous, exceeding the asci, less than 1 μ thick.

On *Strelitzia augusta* Thunb., on leaves, Inanda, Medley Wood 580, 9468, 10442; Isipingo, Doidge, 6639, and Wager, 32423; Scottsburgh, Pole Evans, 6831; Inanda, van der Byl, 6958; Kentani, Pegler 2384, 9422; Durban, van der Byl 498, 32448; Amanzimtoti, Curson, 30774.

This fungus has been redescribed from No. 30774, material in excellent condition collected by Dr. Curson at Amanzimtoti. In most of the other collections the perithecia are old, but typical *Phyllachora* spores have been found in several of them; a few *Phyllachora* asci were even found clinging to the walls of old perithecia in Medley Wood's original collection. The two-celled spores described by Theissen and Sydow (l.c.) and also observed by Doidge (l.c.) are probably those of a parasite invading old perithecial cavities.

On MORACEAE.

Phyllachora amaniensis P. Henn.

Engl. bot. Jahrb. 38 (1905) p. 113; Theiss. and Syd., Ann. Myc. 13 (1915) p. 473; Doidge, Bothalia I (1921) p. 29.

Stromata not on definite leaf spots, but causing some brown discoloration of the leaf tissues in the immediate vicinity, hypophyllous, sometimes faintly visible also on the upper leaf surface, almost always discrete and often rather remote from one another, but usually more or less grouped; the groups are often large and irregular in outline, up to about 3 cm. long and 2 cm. broad, not infrequently on both sides of one of the larger veins which forms the longitudinal axis of the group. Single stromata slightly raised, dull black, round and up to 1 mm. diam., or irregular in outline and up to 2 \times 1 mm.

Stromata deeply and completely immersed in the substratum; clypeus on the lower side of the leaf epidermal, dark olive brown to black, opaque, 25–40 μ thick, obscurely parenchymatous; occasionally there are traces of clypeus formation in the upper epidermis. Stroma in the mesophyll well developed, the cells of the host being permeated by fine, hyaline or pale olive brown, more or less reticulate hyphae.

Perithecia numerous, deeply immersed, rather closely crowded, flattened-globose, 200–300 μ diam. (250–380 μ fide Theissen and Sydow l.c.). Ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with a pore ca. 20 μ broad. Perithecial wall 10–15 μ thick, concentric fibrose, composed of fine hyphae 1–1.5 μ thick, outer layers pale or darker brown, inner layers hyaline. Asci cylindrical, copiously paraphysate, 8-spored, 90–130 \times 9–11 μ . Spores monostichous, continuous, hyaline, ellipsoid, broadly rounded at both ends, 12–16 \times 7.5–8.5 μ .

On *Ficus capensis* Thunb., on leaves, Amanzimtoti, Franks, 7812; Barberton, van der Byl, 7378; Wyebank, Doidge, 9537; Umhlali, Bosman, 29924; Schagen, Liebenberg, 26005.

This species was originally described by Hennings (l.c.) on *Ficus* sp., Amani, Usambara, in Tanganyika Territory, tropical Africa.

***Phyllachora ficuum* Niessl.**

Hedwigia 20 (1881) p. 99; Syd. Ann. Myc. 7 (1909) p. 546.

Trabutia ficuum (Niessl.) Theiss. et Syd., Ann. Myc. 13 (1915) p. 352; Doidge, Bothalia 1 (1921) p. 24.

Not on leaf spots, but causing some indeterminate, yellowish brown discoloration of the leaf tissues. Stromata amphigenous but mostly epiphyllous, scattered or closely set and becoming confluent in small groups, small, 0.5–1 mm. diam., round to irregular in outline, often flat at the margin and convex in the centre over the perithecia, black, shining, especially round the punctiform ostioles.

Stroma between the perithecia light brown to purplish brown, prosenchymatous, composed of vertical, parallel hyphae 5–8 μ thick; covered by a rather massive clypeus, which is black, opaque, 30–35 μ thick. Stroma in the mesophyll poorly developed, but the epidermal cells below the perithecia are permeated by a network of fine hyphae and become disintegrated and golden brown.

Perithecia few in each stroma, with their base on the changed epidermal cells of the host, flattened globose to ellipsoid or lenticular, 220–420 μ diam., 115–200 μ high. Ostiole flat papilliform, completely immersed in the clypeus, periphysate, with a pore about 20 μ broad. Perithecial wall pale, concentric fibrose, not very well developed, 10–12 μ thick. Asci 8-spored, cylindrical-clavate, broadly rounded above, narrowed below into a short stalk, sp. part 55–75 \times 14–18 μ . Spores obliquely monostichous to imperfectly distichous, hyaline, continuous, ovate or broadly ellipsoid, rounded at both ends, 11–14 \times 6.5–9 μ . Paraphyses hyaline, fibrose.

On *Ficus sycomorus* L., on leaves, Mozambique, Howard, 520; Lourenco Marques, Howard, 719; Nelspruit, Liebenberg, 25969; near Salisbury, Verdoorn, 33202.

This fungus was originally described on *Ficus infectoria* collected in Calcutta. One of the collections made by Howard was identified by Sydow (l.c.) as this species; the number is not quoted. The host of the South African collections was wrongly identified (Doidge l.c.); it is *Ficus sycomorus*, not *F. howardiana*.

***Phyllachora grammica* P. Henn.**

Flore du Bas et Moyen Congo. Ann. Mus. du Congo 2 (1907) p. 98.

Catacauma grammicum (P. Henn.) Theiss. et Syd., Ann. Myc. 13 (1915) p. 382; Doidge, Bothalia 1 (1921) p. 26.

Not on definite leaf spots but causing an indeterminate yellowish brown discoloration of the leaf tissues. Stromata scattered, amphigenous, usually only on one side of the leaf, but sometimes opposite one another on the upper and lower surface; following the veins and forming dull black, slightly raised lines or streaks up to 7 mm. long and 0.8 mm. broad, often dendritic and confluent, thus tending to form a loose network.

Stroma between the perithecia prosenchymatous, formed of vertical, parallel, purplish brown hyphae 6–8 μ thick; covered by a clypeus which at first develops in the arched epidermis; clypeus opaque, black or blackish brown, variable in thickness, 30–60 μ , rather obscurely parenchymatous. Stroma in the mesophyll sparse.

Perithecia few in each stroma, with base pressing against the subepidermal cells of the leaf, broadly ellipsoid, 300–350 μ diam., 140–180 μ high. Ostiole flat, papilliform, completely immersed in the clypeus. Perithecial wall 10–15 μ thick, often thinner at the base, concentric fibrose, consisting of delicate, pale purplish brown hyphae. Asci cylindrical, 8-spored, 45–58 \times 7–10 μ . Spores monostichous, continuous, hyaline, ellipsoid, rounded at both ends, 8–10 \times 4–5.5 μ . Paraphyses hyaline, fibrose, breaking down early.

On *Ficus capensis* Thunb., on leaves, Lemana, Northern Transvaal, Doidge, 1829; Kentani, Pegler 1993, 8884; Storm's River, Humansdorp District, Doidge, 17164.

The type specimen was collected by Vanderyst at Kisantu, Congo. No. 1829, quoted above was identified as this species by Theissen and Sydow (l.c.).

***Phyllachora Howardiana* Petr.**

Ann. Myc. 27 (1929) p. 386.

Trabutia Evansii Theiss. et Syd. (not *Phyllachora Evansii* Syd.) Ann. Myc. 13 (1915) p. 352; Doidge, Bothalia 1 (1921) p. 24.

Not on definite leaf spots but causing some yellowish brown or reddish brown discoloration of the leaf tissues; on *Ficus capensis* old stromata are often surrounded by a narrow zone of white. Stromata small, black, convex, round, up to 1 mm. diam., more or

less regularly arranged in groups 5 mm. to 1 cm. diam., 10-50 stromata or more in each group; often closely crowded but not becoming completely fused with one another. Not infrequently the groups of stromata are numerous and become confluent, so that the small stromata are distributed more or less evenly over the whole leaf surface.

Clypeus arched, opaque black, massive, 50-80 μ thick; stroma between the perithecia prosenchymatous, composed of greyish brown, vertical parallel hyphae 4-5 μ thick. Stroma in the mesophyll poorly developed, but the epidermal cells are filled with a mass of fine hyphae and they become discoloured and broken down.

Perithecia 1-2 in each stroma, rarely more, flattened globose to lenticular, 250-550 μ diam., 150-250 μ high, with base resting on the changed epidermal cells of the leaf; ostiole flat, papilliform, completely immersed in the clypeus, periphysate. Perithecial wall light or dark brown, concentric fibrose, 15-18 μ thick. Asci cylindrical with monostichous spores or clavate with distichous or more or less conglabate spores, 70-90 \times 10-16 μ . Spores ellipsoid, broadly rounded at both ends, hyaline, continuous, 11-14 \times 8-9.5 μ . Paraphyses hyaline, fibrose, breaking down early and becoming unrecognisable.

On *Ficus carica* L., on leaves, Lourenco Marques, Howard, 668, Type.

Ficus capensis Thunb., Umhlali, Bosman, 29923.

Phyllachora nervisequens (Lingelsh.) Petr.

Ann. Myc. 27 (1929) p. 386.

Phyllachora Schweinfurthii P. Henn. var. *nervisequens* Lingelsh. Engl. bot. Jahrb. 39 (1907) p. 604.

Trabutia nervisequens (Lingelsh.) Theiss. et Syd., Ann. Myc. 13 (1915) p. 353; Doidge, Bothalia 1 (1920) p. 25.

Stromata usually epiphyllous, but occasionally developing also on the under side of the leaf, not on typical leaf spots but almost always causing a yellowish brown or greenish yellow discoloration of the leaf tissues, visible also on the under side of the leaf. Stromata developing exclusively on the midrib and on the lateral veins, often broadly elliptic in outline, often angular and more or less irregular, elongated in the direction of the veins and coalescing more or less freely; small stromata may be only 1 mm. long, large compound stromata up to 1 cm. long (2 cm. in the type). Stromata black, somewhat shiny, superficial, uneven in thickness, sterile parts of the stroma less raised and with a wrinkled surface; elsewhere the surface is indistinctly mammilose through the slightly prominent perithecia, the punctiform ostioles being surrounded by a slightly depressed ring. Stroma between the perithecia purplish brown, parenchymatous, composed of vertical, parallel hyphae 7-9 μ thick, covered by a rather massive, opaque black clypeus, uneven in thickness, 50-90 μ , most frequently ca. 75 μ thick. Stroma in the mesophyll sparse, consisting of a few hyaline hyphae.

Perithecia few or many in each stroma, close together or rather remote from one another, with base resting on the epidermal cells of the leaf, flattened globose, 200-400 μ diam., or lenticular, 400-600 μ diam., 200-300 μ high. Ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with a more or less round pore. Perithecial wall well developed, 12-18 μ thick, concentric fibrose, composed of rather delicate brown hyphae 2-2.5 μ thick. Asci cylindrical, rounded above, narrowed below into a short stalk, 8-spored, 75-110 \times 11-14 μ . Spores usually monostichous, broadly ellipsoid, continuous, hyaline, 12-16 \times 8-10 μ . Paraphyses hyaline, fibrose, breaking down early.

On *Ficus Burtii* Dargi Hutch., on leaves, Umgeni Lagoon, Durban, Doidge, 854; Port Shepstone, Pole Evans, 5608; Amanzimtoti, Franks, 7813.

Ficus natalensis Hochst., Malvern, Natal, Doidge, 1994; Winkle Spruit, Pole Evans, 2019; Port Elizabeth, D. Gunn, 12248; Escombe, Hean, 33109.

Ficus Burkei Miq., Eastern Transvaal, Liebenberg, 32884.

Number 12248 was described (Bothalia l.c.) as var. *robusta* of *Trabutia nervisequens*; the fungi of this group are variable in stroma development and the separation of this collection as a distinct variety is not justifiable. The species was originally described on *Ficus Hochstetteri* var. *glabrior* collected in Abyssinia. The South African specimens have comparatively small stromata and are not so extensively developed on the veins; otherwise they resemble the type.

Phyllachora Pretoriae Doidge nov. spec.

Stromata sine maculis, amphigena, subinde sparsa plerumque autem secus venas evoluta et conflundo greges longos dendriticos v. irregulares formantia, minuta, usque 0.5 mm. diam., atra, convexa, inter cuticulam et epidermidem formata; stromate inter

perithecia bene evoluta, verticaliter prosenchymatico ex hyphis olivaceo-brunneis, 5-6 μ crassis composito; clypeo atro, opaco, 25-35 μ crasso. Perithecia 1 usque pauca in quoque stromate, depresso-globosa v. elliptica, 250-350 μ diam., 180-200 μ alta, ostiolo plano, papilliformi, clypeo omnino immerso praedita; pariete perithecii brunneo, 5-15 μ crasso, concentric fibroso, indistincte celluloso. Asci paraphysati, 8-spori, cylindraceo-clavati, mox diffuentes, p. sp. ut videtur, 70-75 \times 15 μ . Sporae distichae, hyalinae, continuae, ellipsoideae, raro subglobosae, urtinue rotundatae, 15-17.5 \times 7-9 μ , raro usque 20 μ longae et 10 μ latae.

Hab. in foliis *Fici Pretoriae*, Rustenburg, leg. Kresfelder, 23675.

Not on leaf spots and rarely causing any definite discoloration of the leaf tissues. Stromata amphigenous, sometimes scattered, but usually developing in rows along the veins, often coalescing in long lines or irregular groups, frequently dendritic. Single stromata minute, round to irregular in outline, up to 0.5 m. diam., convex, dull black, shining around the punctiform ostiole.

Superficial stroma around or between the perithecia prosenchymatous, olive brown, composed of vertical parallel hyphae 5-6 μ thick; outer layers forming a clypeus 25-35 μ thick, blackish brown to black, opaque, obscurely parenchymatous, the epidermal cells of the host beneath the perithecia are filled with fine, pale brown or subhyaline hyphae, some of which extend into the mesophyll.

Perithecia usually single in each individual stroma, occasionally 2-3, with base resting on the epidermal cells of the leaf, flattened globose or ellipsoid, 250-350 μ diam., 180-200 μ high; ostiole flat, papilliform, completely immersed in the clypeus, with a pore 10-12 μ broad, paraphyses sparse; perithecial wall dark brown, firm, subopaque, concentric fibrose and indistinctly cellular, 5-10 μ thick at the base, ca. 15 μ thick at the sides, merging above the clypeus. Asci 8-spored, cylindrical-clavate, breaking down early; so far as could be observed, sp. part 70-75 \times 15 μ . Spores distichous, hyaline, continuous, ellipsoid, rarely subglobose, rounded at both ends, 15-17.5 \times 7-9 μ ; rarely up to 20 μ long and 10 μ broad. Paraphyses breaking down early and becoming unrecognisable.

On *Ficus Pretoriae* Burtt-Davy, Rustenburg, Kresfelder, 23675.

Phyllachora repens (Corda) Sacc.

Syll. Fung. 2 (1883) p. 597; Lorrain Smith, Cat. of Welwitsch's African Plants 2 (1901) p. 477.

Sphaeria repens Corda, Icon. Fung. IV, p. 42, tab. IX, f. 123 (1840).

Isothea rhytismoides Fr., Welw. and Curr. in Trans. Linn. Soc. 26 (1870) p. 285.

Dothidea repens Berk., Hook. Jour. Bot. (1854) p. 231; Kalchbrenner, Grev. X (1882) p. 145; Cooke, Grev. VIII (1879) p. 72 and X (1881) p. 27.

Catacauma repens (Corda) Theiss. et Syd., Ann. Myc. 13 (1915) p. 383.

This species was described by Corda from leaves of *Ficus religiosa* collected in India. Two collections on *Ficus ingens* Miq., made by Medley Wood at Inanda in Natal (*Medley Wood* 228, 9466 and *Medley Wood* 543, 10435) were assigned to this species by Kalchbrenner and Cooke (loc. cit.). Portions of these collections are to be found in the Pretoria Herbarium but unfortunately both are in poor condition; *Medley Wood* 228 may possibly be *Phyllachora grammica* P. Henn.; *Medley Wood* 543 differs very considerably in habit, stroma and form and size of perithecia, but the latter appear to be immature and neither asci nor spores are present. Further collections of *Phyllachora* on this host are necessary.

Phyllachora repens has also been recorded from Africa by Lorrain Smith (l.c.) on leaves of *Ficus trachyphyllus* Fenzl, in woods at Monimo, Huilla, *Welwitsch* 141 and near Lopollo, Huilla, *Welwitsch* 6374. There has been no opportunity of examining these specimens.

On PROTEACEAE.

Phyllachora Proteae Wakef.

Kew Bull. (1922) p. 164.

Stromata epiphyllous, scattered, minute, 200-300 μ diam., round, discrete, very rarely becoming confluent, flat at the periphery, raised and more or less convex in the centre, dull black.

Stromata formed under the stromata of the leaf; clypeus covered by the thick cuticle, epidermal, 20-30 μ thick, limited in extent, not extending beyond the perithecium or barely so, opaque, black, formed of dark olive brown, parenchymatous cells ca. 5 μ diam.; the clypeus is continuous with a zone, 30-50 μ deep, of opaque, black or dark olive brown

stromatic tissue, surrounding the single perithecium, similar in structure to the clypeus, parenchymatous, but formed of somewhat larger, round to angular cells, ca. $7-8\ \mu$ diam. Elsewhere the stroma consists of light or dark brown, branching hyphae, $2.5-3\ \mu$ thick, which penetrate to some distance between the cells of the mesophyll.

Perithecium solitary, immersed in the mesophyll, globose or flattened globose, $180-200\ \mu$ diam., $150-180\ \mu$ high; ostiole flat, papilliform, completely immersed in the clypeus; perithecial wall pale, concentric fibrose, not sharply differentiated outwardly from the stroma. Asci copiously paraphysate, cylindrical, briefly stipitate, $120-150 \times 12-15\ \mu$. Spores obliquely monostichous, ovate, tapering somewhat to rounded ends, continuous hyaline, $19-20 \times 8-9\ \mu$. Paraphyses branched, filiform, exceeding the asci.

On *Protea mellifera* Thunb., on leaves, Klappmuts, *van der Byl* 357, 32915.

I am indebted to Miss Wakefield for a small portion of the type specimen. The stroma of this fungus differs from that of most *Phyllachora* spp.; among the South African species, it rather closely resembles that of *Ph. superba* on *Eragrostis superba*.

On LEGUMINOSAE.

Phyllachora Halsei Doidge nov. spec.

Stromata amphigena, plerumque epiphylla, sine maculis, decoloratione flavo-brunnea circumdata, in pagina contraria vix vel parce visibilia, sparsa vel pauca aggregata, atra, nitida, fortiter convexa, subinde etiam petiolicola; clypeo solum in epidermide supra perithecia evoluta, ultra haud vel vix extenso, atro-brunneo, parenchymatico, $25-37.5\ \mu$ crasso. Perithecia plerumque solitaria in quoque stromate, depresso-globosa, $230-300\ \mu$ diam., $140-240\ \mu$ alta, profunde immersa; ostiolo plano, papilliform, periphysato, clypeo omnino immerso, poro rotundato ca. $10\ \mu$ lato aperto praedita; pariete perithecii pallide vel flavidulo-brunneo, $8-10\ \mu$ crasso, concentric fibroso. Asci 8-sporei, clavati usque fusiformes, $100-110 \times 15-17.5\ \mu$. Sporae distichae, anguste ellipsoideae, utrinque leniter attenuatae sed obtusae, hyalinae, continuae, $15-18 \times 5-5.5\ \mu$. Paraphyses numerosas, filiformes.

Hab. in foliis *Acaciae Gerrardi*, Verulam, Natal, leg. Halse, 30128.

Not on definite leaf spots, but causing some yellowish brown discoloration of the tissues of the host which is faintly visible on the opposite side of the leaf. Stromata amphigenous, mostly epiphyllous, scattered or in small groups, minute, more or less circular in outline, $0.25-0.5\ \text{mm.}$ diam., black, shining, strongly convex.

Clypeus only in one epidermis, limited in extent, not extending beyond the perithecium or extending only about $50\ \mu$ beyond it, blackish brown, opaque, obscurely parenchymatous, $25-37.5\ \mu$ thick. Stroma in the mesophyll sparse and poorly developed.

Perithecia usually solitary in each stroma, deeply immersed, flattened globose, $230-300\ \mu$ diam., $140-240\ \mu$ high; ostiole flat, papilliform, completely immersed in the clypeus, with fine hyaline paraphyses and a pore ca $10\ \mu$ broad. Perithecial wall delicate, pale to yellowish brown, $8-10\ \mu$ thick, concentric fibrose. Asci 8-spored, often cylindrical at first with obliquely monostichous spores; mature asci clavate to fusiform, $100-110 \times 15-17.5\ \mu$, with incompletely distichous spores, more or less rounded above, narrowed somewhat at the base into a stalk which may be short or up to $20\ \mu$ long. Spores narrow ellipsoid, tapering slightly but definitely to rounded ends, hyaline, continuous, $15-18 \times 5-5.5\ \mu$, Paraphyses numerous, hyaline, exceeding the asci.

On *Acacia Gerrardi* Benth., on leaves and petioles, Verulam, Halse, 30128, Type; Nelspruit, Doidge, 32405.

Acacia Benthami Roxbr., Scottsburgh, Natal, Halse, 30380.

Acacia robusta Burch., Umzinto, Natal, McClean, 30116.

This fungus is near *Phyllachora Acaciae* P. Henn. (Ann. Myc. 13, 1915, p. 488), on *Acacia Farnesiana* from Ecuador and *A. amentacea* from Mexico, but in the American species there is a clypeus both above and below the perithecia and hence it is conspicuous on both sides of the leaf. It also seems to differ from *Phyllachora sudanensis* Petr. (Ann. Myc. 29, 1931, p. 357) which has larger perithecia and ellipsoid spores which do not taper to the ends or taper very slightly. No specimen of the latter species on *Acacia verrucosa* from the Sudan has been seen.

In the collection on *Acacia Benthami* cited above, the spores are slightly smaller, up to $12.5 \times 5\ \mu$ and more broadly rounded at the ends; the asci are also smaller, up to $100 \times 17.5\ \mu$; this material is possibly not quite mature.

Phyllachora rikatiensis (Doidge) Petr.

Ann. Myc. 25 (1927) pp. 291-293.

Phyllachorella rikatiensis Doidge, Bothalia I (1921) p. 30.

Stromata amphigenous, in small groups; the groups are round to irregular and up to 5 mm. diam., sometimes numerous, becoming confluent and covering the greater part of the leaf surface. Single stromata usually discrete, rarely close together and becoming fused, round, elliptic or bluntly angular, 300-500 μ diam., smooth, black, shining, slightly convex.

Clypeus on both sides of the leaf, developing in the epidermis and in the mesophyll, usually 25 μ thick at the margin, up to 50 μ in the centre, black, opaque, obscurely parenchymatous, extending beyond the perithecia to a distance of 80 μ over the mesophyll. The mesophyll of the leaf between the two clypeus plates is almost entirely broken down and discoloured and is permeated by olive brown or blackish brown stroma tissue.

Perithecia deeply immersed, usually solitary, sometimes 2 or more are closely crowded under one clypeus, very variable in form and size; often irregular, seldom lenticular or globose, 180-350 μ diam., 120-200 μ high; perithecial wall usually 10-20 μ thick, concentric fibrose, indistinctly cellular. Asci clavate or cylindrical-clavate, sometimes fusiform, broadly rounded above, tapering somewhat towards the base, which is sessile or has a short, knob-like foot, thin-walled, 8-spored, 50-60 \times 10-15 μ . Spores usually more or less completely distichous, occasionally monostichous, oblong, broadly rounded at both ends, continuous, hyaline, 10-13 μ long, rarely up to 15 μ , 4-5 μ broad, with epispore ca. 0.5 μ thick. Paraphyses rather sparse, broadly filamentous, ca. 2-4 μ broad, very thin-walled, early becoming mucilaginous and unrecognisable.

On *Andradia arborea* Sim, Rikatli, Mozambique, Junod, 11726.

Petrak points out that the conidial form observed (Doidge l.c.) can only be regarded as a parasite of the *Phyllachora*. He has described it fully (l.c.) under the name *Microdiplodia rikatiensis* Petr.

Phyllachora Brachystegiae Doidge.

Bothalia I (1924) p. 220.

Not on leaf spots. **Stromata** epiphyllous but often visible also on the lower side of the leaf, scattered, often developing on either side of the midrib of the leaf or on the lateral veins, circular or broadly elliptic, black, somewhat shiny, g, convex, mostly 0.4-0.6 mm. diam.

Clypeus in both upper and lower epidermis, extending for some distance beyond the perithecia over the mesophyll, brownish black, opaque, ca. 25-30 μ thick, obscurely parenchymatous. **Stroma** in the mesophyll consists of fine, hyaline hyphae permeating the tissues; as the stromata become old, the leaf tissue between the upper and lower clypeus becomes discoloured and dead.

Perithecia usually solitary, rarely 2 are found under one clypeus, flattened globose, 250-400 μ diam., 240-300 μ high, deeply immersed and reaching the lower clypeus; ostiole flat, papilliform, completely immersed in the clypeus. Perithecial wall delicate, concentric fibrose, indistinctly cellular, not sharply defined, outer layers light brown, ca. 10 μ thick, inner layers delicate, hyaline. Asci 8-spored, cylindrical or cylindrical-clavate, rounded above, tapering more or less towards the base, 75-120 \times 13-16 μ . Spores obliquely monostichous, less frequently incompletely distichous, ellipsoid to subclavate, broadly rounded above, usually tapering more or less to an obtuse or rounded base, 16-22.5 \times 6-7.5 μ .

On *Brachystegia* sp., on leaves, Salisbury, Eyles, 11680, Type; Dombashana, van der Byl 2443.

Brachystegia Randii Bak. f., Salisbury, Eyles 5023, 5024, 5025 (van der Byl 2462, 2460, 2464).

Phyllachora puncta (Cke.) Doidge nov. comb.

Dothidea puncta Cke., Grevillea X (1882) p. 128.

Parodiella puncta (Cke.) Sacc., Syll. Fung. I, p. 718.

Catacauma punctum (Cke.) Theiss. et Syd., Ann. Myc. 15 (1917) p. 141.

Not on leaf spots, but causing a vague, yellowish brown discoloration of the leaf tissues in the neighbourhood of the stromata. **Stromata** amphigenous, sometimes solitary, often several on one leaflet, black, shining, strongly convex, more or less circular, up to ca. 0.5 mm. diam., often developing in close proximity to one another and becoming completely fused, forming larger, compound stromata which are round to irregular up to ca. 1 mm. diam., or elongated along a vein.

Clypeus originating in the epidermis and becoming arched over the perithecia, blackish brown, opaque, 30–40 μ , or in places up to 60 μ thick, obscurely parenchymatous. Stroma between or around the perithecia often loosely parenchymatous under the clypeus, elsewhere indefinite in structure, brown to subhyaline; hyaline hyphae also extend into the mesophyll.

Perithecia usually solitary in individual stromata, compound stromata often with 2–5, or as many as 8 perithecia, subglobose to ellipsoid, with base resting on the subepidermal cells of the leaf, 150–350 μ diam., 150–300 μ high; ostiole flat, papilliform, completely immersed in the clypeus, periphysate. Perithecial wall light to dark olive brown, well developed, concentric fibrose, 10–15 μ thick, merging above with the clypeus. Asci numerous, 8-spored, sp. part ellipsoid to clavate, tapering somewhat to the rounded apex, attenuate at the base to a short foot or a longer stalk up to 20 μ long, less frequently cylindrical, 60–70 \times 15–20 μ . Spores completely or incompletely distichous in the ellipsoid or clavate asci, obliquely monostichous in the cylindrical asci, ovate or broadly ellipsoid, broadly rounded at both ends, continuous, hyaline, 12–15 \times 8–10 μ . Paraphyses hyaline, numerous, fibrose.

On *Dalbergia armata* E. Mey., on leaves, Inanda, *Medley Wood* 665, 607, 9488, 10441; Barberton, *Pole Evans*, 588; Umgeni Lagoon, Durban, *Doidge*, 881; Stella Bush, Durban, *Doidge*, 1662; Verulam, *Pole Evans*, 6809; Schagen, *Liebenberg*, 29908, 29880; Amanzimtoti, *Doidge*, 30289; Umbogintwini, *Wager*, 32718.

Numbers 588, 1662 and 6809 cited above were described as *Catacauma dalbergiicola* (P. Henn.) Theiss. et Syd. (= *Phyllachora dalbergiicola* P. Henn.) in *Bothalia* I (1921) p. 25; this is a closely related species, and is perhaps only an American variety of *Phyllachora puncta*; in the American species the spores are narrower, 12–14 \times 6–7 μ , than in the South African collections, and the perithecia are larger.

Phyllachora Peltophori Syd.

Ann. Myc. 10 (1912) p. 40; Theissen and Sydow, Ann. Myc. 13 (1915) p. 507; *Doidge*, *Bothalia* I (1921) p. 29.

Not on leaf spots, nor causing any marked discoloration of the leaf tissues. Stromata amphigenous, scattered or more or less grouped, not infrequently numerous and becoming confluent, minute, black, shining, convex, more or less circular, mostly 250–350 μ diam., rarely up to 500 μ .

Clypeus over the perithecia opaque black, 20–25 μ thick, extending only a short distance beyond the perithecia; similar in the opposite epidermis, or sometimes rather poorly developed.

Perithecia solitary, deeply immersed, globose or flattened globose, 180–300 μ diam., mostly 160–180 μ , sometimes up to 240 μ high. Ostiole flat, papilliform, completely immersed in the clypeus, copiously periphysate, with a circular pore ca. 10 μ broad. Perithecial wall weak, poorly differentiated, hyaline, concentric fibrose. Asci 8-spored, ellipsoid to ellipsoid-clavate, less frequently cylindrical, rounded above, narrowed below into a short stalk, 65–80 \times 13–19 μ . Spores distichous, continuous, hyaline, ellipsoid, rounded at both ends, 13–17 \times 6–8 μ . Paraphyses numerous, fibrose.

On *Peltophorum africanum* Sond., Ladzce, Northern Transvaal, *Doidge*, 1810, Type; Nelspruit, *Loest*, 29888 and *Doidge* 32400.

Phyllachora Pterocarpi Syd.

Ann. Myc. 10 (1912) p. 40.

Catacauma pterocarpi Syd., Ann. Myc. 13 (1915) p. 387; *Doidge*, *Bothalia* I (1921) p. 25; Hopkins, Trans. Rhod. Sc. Ass. 35 (1938) p. 103.

Not on definite leaf spots, but tissues near the stromata are vaguely discoloured, often remaining dull green after the leaf has turned brown. Stromata epiphyllous, small, scattered, round to irregular in outline, 1–2 mm. diam., black, shining, convex, with uneven surface; at times isolated stromata become surrounded by a concentric ring of secondary stromata; often stromata are very numerous and closely set over the whole leaf surface.

Clypeus originating in the epidermis, becoming arched over the perithecia but extending on either side of them for some distance over the mesophyll of the leaf, blackish brown, opaque, variable in thickness, ca. 25 μ thick near the apex of the perithecium, elsewhere up to 50 μ thick. Stroma between the perithecia olive brown or greyish brown, loosely parenchymatous or indefinite in structure; from this hyaline hyphae extend into the cells of the leaf, permeating the mesophyll.

Perithecia 1-9 in each stroma, with base pressing on the subepidermal cells of the leaf, globose or flattened globose, occasionally ellipsoid to lenticular, 350-450 μ diam., 240-300 μ high; ostiole flat, papillate, completely immersed in the clypeus, periphysate, with pore ca. 15 μ broad. Perithecial wall concentric fibrose; at the base, where it is closely applied to the cells of the host, usually golden brown, ca. 10 μ thick; lateral walls usually olive brown, ca. 15 μ thick, but not sharply defined outwardly and merging with the hyphae composing the stroma. Asci very numerous, lining the base and sides of the perithecia, 8-spored, sp. part ellipsoid, clavate or cylindrical-clavate, not tapering or tapering somewhat to the rounded apex, 60-80 \times 16-24 μ , attenuated below into a short foot or a longer stalk 25-30 μ long. Spores more or less completely distichous or monostichous, hyaline, continuous, ellipsoid, but with the greatest diameter often somewhat above the centre, broadly rounded at both ends, 16-21 \times 8-9 μ . Paraphyses numerous, hyaline, fibrose.

On *Pterocarpus angolensis* D.C., on leaves, Letaba Drift, Northern Transvaal, Doidge, 1807, Type; Barberton, van der Byl, 1922, 5132; Schagen, Liebenberg, 26354; Pretorius Kop, Kruger National Park, Lansdell, 29954.

Pterocarpus erinaceus Lam., Nelspruit, Loest, 29891; Salisbury, Eyles 5020 (van der Byl 2461); Mazoe, van der Byl 2459; Matopos, Eyles 5019 (van der Byl 2463).

Pterocarpus rotundifolius (Sond.) Druc (= *Pt. sericeus* Benth.), Nelspruit, Wager, 23413, and Doidge, 32402; Schagen, Liebenberg, 26014; Khami Ruins, van der Byl 204; Tzaneen, van der Byl 1502.

Pterocarpus sp., Rhodesia, van der Byl 65.

Phyllachora Schotiae Doidge nov. comb.

Catacauma Schotiae Doidge, Bothalia 1 (1922) p. 65.

Not on leaf spots, nor causing any marked discoloration of the leaf tissues. Stromata epiphyllous, scattered, minute, black, convex, more or less circular or oval in outline, 0.3-0.4 μ diam.

Clypeus only in the upper epidermis, black, opaque, 30-40 μ thick, remaining covered by the thick cuticle which is 10-16 μ thick; the clypeus does not always completely cover the perithecium, being sometimes 100 μ less in diameter; sometimes it is rather poorly developed, not quite continuous nor completely filling the epidermal cells. Stroma plectenchymatous, consisting of a web of fine, hyaline hyphae around the perithecia, which extends for some distance between the epidermis and the palisade cells; stroma in the mesophyll sparse and poorly developed.

Perithecia usually solitary, rarely two are found crowded together under one clypeus, ellipsoid to lenticular, 300-450 μ diam., 100-150 μ high, with base pressing against the subepidermal layer of cells, which becomes concave. Ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with pore 15-17 μ broad. Perithecial wall very pale, subhyaline, concentric fibrose, 12-16 μ thick. Asci paraphysate, 8-spored, oblong or ellipsoid, tapering somewhat to the rounded apex, sessile, 80-87 \times 17-20 μ . Spores distichous, hyaline, continuous, ellipsoid-oblong, rounded at both ends, often more broadly rounded above and tapering somewhat downwards, sometimes slightly asymmetrical, 20-24 \times 6-7 μ ; immature spores seem to be surrounded by a mucilaginous envelope.

On *Schotia speciosa* Jacq., on leaves, Humewood, Port Elizabeth, Doidge, 2294.

Phyllachora Tephrosiae Syd.

Ann. Myc. 22 (1924) p. 430.

Not on leaf spots, nor causing any marked discoloration of the leaf tissues. Stromata epiphyllous, scattered over the whole leaf surface, more or less numerous, round or irregular in outline, sometimes becoming confluent, 0.5-1 mm. diam., rather strongly convex, black, shining.

Clypeus in the upper epidermis, dense black, opaque, 25-40 μ thick, and often extending for some distance beyond the perithecia, over the mesophyll; often present also in the lower epidermis, where it is not so well developed nor so extensive. Stroma in the mesophyll well developed between and around the perithecia under the clypeus, light olive brown, composed of hyphae 4-5 μ thick; elsewhere in the mesophyll usually sparse.

Perithecia several in each stroma, deeply immersed, globose or angular from mutual lateral pressure, 150-250 μ diam. Ostiole flat, papilliform, completely immersed in the clypeus, copiously periphysate, with a round pore ca. 15 μ broad. Perithecial wall light to dark olive brown, concentric fibrose, 15-20 μ thick. Asci cylindrical to clavate, briefly stipitate, 8-spored, 50-70 \times 12-20 μ , copiously paraphysate. Spores monostichous,

distichous or conglobate, broadly ellipsoid to subglobose, rounded at both ends, continuous, hyaline, $9-12 \times 8-9 \mu$.

On *Tephrosia Nyassae* E. G. Baker, on leaves, Tzaneen, van der Byl 1662, 20447 (ex Herb. Sydow, portion of type collection).

Phyllachora circinata (Kalch. et Cke.) Theiss. et Syd.

Ann. Myc. 15 (1917) p. 141.

Dothidea circinata Kalch. et Cke., Grevillea IX (1880) p. 32.

Parodiella circinata (K. et Cke.) Sacc., Syll. Fung. L, p. 718.

Stromata on poorly defined, somewhat brownish or greenish leaf spots, single or in small groups, visible on both sides of the leaf, minute, up to 0.4 mm. diam., black, somewhat shiny.

Clypeus epidermal, on both sides of the leaf, dense black, opaque, $30-45 \mu$ thick.

Perithecia solitary, deeply immersed, occupying the whole of the mesophyll. Asci not numerous, 8-spored, paraphysate, cylindrical, $55-70 \times 9-12 \mu$. Spores monostichous, ellipsoid or ovate, continuous, hyaline, $9-11 \times 5-6 \mu$.

On leaves of Leguminosae undet. (possibly *Phaseolus* sp. or *Dolichos* sp.), Natal, Medley Wood 49, Herb. Kew.

There was no opportunity of examining the type specimen; the details given above are taken from the description by Theissen and Sydow (l.c.).

On RUTACEAE.

Phyllachora Tecleae Doidge.

Bothalia I (1922) p. 68.

Stromata amphigenous, mostly epiphyllous, visible on both sides of the leaf, grouped on yellowish brown leaf spots which are usually oblong or elliptic in shape and run between two lateral veins of the leaf. Stromata oval-elliptic or almost round, 1.5-2.5 mm. long, 0.5-1 mm. broad, black, somewhat shining, raised, usually discrete, rarely becoming fused to form compound stromata.

Clypeus epidermal, well developed on both sides of the leaf, black, opaque, $40-50 \mu$ thick in the upper epidermis, $23-25 \mu$ thick in the lower. Stroma in the mesophyll consisting of light brown to hyaline hyphae, branched and reticulate, permeating the tissues between the two clypeal plates, the cells in this region becoming brown and dead.

Perithecia several in each stroma, deeply immersed, with base reaching the clypeus in the opposite epidermis, globose or flattened globose, $250-400 \mu$ diam., $250-300 \mu$ high. Ostiole flat, papilliform, completely immersed in the clypeus, very copiously periphysate, with a circular pore ca. 15μ broad. Perithecial wall concentric fibrose, ca. $20-25 \mu$ thick, outer layers light brown, inner hyaline, not always sharply defined outwardly where it merges with the stromatal hyphae. Asci copiously paraphysate, 8-spored, cylindrical, with a short foot, $80-90 \times 10-13 \mu$. Spores obliquely monostichous, continuous, hyaline, ellipsoid or subfusoid, tapering somewhat to rounded ends, $13-17 \times 5-6 \mu$.

On *Teclea natalensis* Engl., Kentani, Pegler 2324, 9079.

On EUPHORBIACEAE.

Phyllachora Crotonis (Cke.) Sacc.

Syll. Fung. 2 (1883) p. 599; Theiss. and Syd., Ann. Myc. 13 (1915) p. 523; Doidge,

Bothalia I (1922) p. 67.

Dothidea Crotonis Cke., Grevillea X (1882) p. 129.

Phyllachora crotonicola Pat., Bull. Soc. Myc. Fr. 9 (1893) p. 156.

Trabutia crotonicola Rehm., Hedwigia 29 (1890) p. 160.

Phyllachora Julcrotonis Bres., Hedwigia 35 (1896) p. 668.

Stromata grouped on indeterminate, yellow brown leaf spots which are visible on both sides of the leaf. Single stromata round, 0.3-0.5 mm. diam., black, somewhat shining, convex; very often closely crowded and forming larger, irregular, compound stromata which are not infrequently elongated along the veins of the host and are occasionally dendritic.

Clypeus developed in the epidermis on both sides of the leaf, brownish black, opaque, $20-30 \mu$ thick in the upper epidermis, $8-10 \mu$ thick in the lower, not extending beyond the perithecia. In compound stromata, the leaf tissue between the perithecia is permeated by light brown, branched, more or less reticulate hyphae, $2.5-4 \mu$ thick.

Perithecia solitary in single stromata, but usually stromata become fused and a number of perithecia are found under a common clypeus. Perithecia deeply immersed,

occupying the whole thickness of the mesophyll, globose or somewhat flattened, 200–350 μ diam., 150–250 μ high. Ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with round pore ca. 15 μ broad. Perithecial wall concentric fibrose, light brown, composed of delicate hyphae 2.5–3 μ thick, indefinitely cellular, not sharply defined, merging outwardly with the stromatal hyphae and inwardly with the hyaline ascogenous layers. Asci copiously paraphysate, cylindrical to clavate, sp. part cylindrical, 80–90 \times 11–14 μ , or clavate ellipsoid, 65–70 \times 16–20 μ , rounded above, attenuated below into a short or longer stalk, usually 25–30 μ long, sometimes up to 50 μ . Spores obliquely monostichous in the cylindrical asci, imperfectly distichous in the clavate asci, broadly ellipsoid, broadly rounded at both ends, hyaline, continuous, 12.5–16 \times 7.5–9 μ .

On *Croton sylvaticus* Hochst., on leaves, Inanda, Medley Wood 406, 9489 (Part of type collection).

Theissen and Sydow (l.c.) state that this fungus occurs on a number of *Croton* spp. throughout South America. They did not examine the original collection quoted above, but think there is no doubt that this South American species is identical with that collected in Natal by Medley Wood. This is confirmed by a comparison with a collection made by Dr. Sydow in Costa Rica, which is the only American collection in the Pretoria Herbarium.

On MELIANTHACEAE.

Phyllachora Melianthi (Thüm.) Sacc.

Syll. Fung. IX (1891) p. 1013; Theiss. and Syd., Ann. Myc. 13 (1915) p. 528;

Doidge, Bothalia I (1921) p. 28.

Rhytisma Melianthi Thüm., Flora (1876) p. 569.

Dothidea lucens Cke., Grevillea X (1882) p. 128.

Dothidea Melianthi Kalch. et Cke., Grevillea X (1882) p. 146.

Phyllachora lucens (Cke.) Sacc., Syll. Fung. II (1883) p. 600; Theiss. and Syd., Ann. Myc. 13 (1915) p. 562; Doidge, Bothalia I (1922) p. 68.

Not on leaf spots. Stromata amphigenous, mostly epiphyllous, scattered more or less thickly over large areas of the leaf surface, or (on *Bersama*) in more or less circular groups, mostly discrete, occasionally becoming confluent, small, black, circular to broadly elliptic in outline, 0.5–1.5 mm. diam., often raised, shining, and either rounded or conical in the centre with a flat, dull black margin; on the opposite side of the leaf, the epidermis is at first raised and greyish in appearance, but finally becomes filled with stromatic tissue and is dull black.

Clypeus epidermal, well developed over the perithecia, black, opaque, carbonaceous, 25–30 μ thick; not so well developed in the epidermis below the perithecia. Stroma in the mesophyll dark to light brown, formed of rather loosely reticulate hyphae, 2.5–4 μ thick, often forming a sterile border round single perithecia or filling the space between perithecia which are remote from one another but under a common clypeus.

Perithecia 1 or several in each stroma, solitary, crowded together and somewhat flattened laterally or remote from one another, globose or flattened globose, 240–350 μ diam. or (in stromata on *Bersama*) up to 450 μ diam., 240–300 μ high, deeply immersed. Ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with a pore 12–15 μ broad. Perithecial wall not very well defined except where there is a common wall between two perithecia, 8–15 μ thick, light brown, concentric fibrose, merging outwardly with the hyphae forming the stroma and inwardly with the hyaline ascogenous layers. Asci 8-spored, cylindrical to clavate, rounded above, tapering below to a short foot or to a stalk up to 20 μ long, 60–80 \times 12.5–18 μ . Spores monostichous in the cylindrical asci, incompletely distichous in the clavate asci, hyaline, continuous, ellipsoid, rounded at both ends, 12.5–15 \times 6–8 μ .

On *Melianthus major* L., on leaves, Boschberg Mts., near Somerset East, MacOwan 1266, 20828 (de Thümen, Myc. Univ. 1267), 21974, this is part of the type collection; near Cape Town, MacOwan (Rabh. Wint. Fung. Eur. 3557), 3897; Stellenbosch, van der Byl 228.

Bersama lucens Szysz., Kentani, Pegler, 9077 (the wrong number was cited in Bothalia 1. c.).

Bersama Swinnyi Phill., Inanda, Medley Wood 581 [Type collection of *Ph. lucens* (Cke.) Sacc.] 9487, 10443.

Bersama Tysoniana Oliver, West Wood, Haenertsburg, Doidge, 17776.

Medley Wood 581, "on leaves", described by Cooke as *Dothidea lucens*, is the same fungus as that on *Melianthus* and *Bersama*; the host is *Bersama Swinnyi* Phill., and stromata of the fungus were found in the phanerogamic herbarium on authentic material of this plant collected at Port St. Johns.

A collection on *Melianthus major*, No. 2427 in the van der Byl herbarium, and named *Phyllachora Melianthi*, collected by Dippenaar at Tulbagh, is a conidial form, with stromata in groups often following the veins; the conidia are filiform, hyaline. There are no asci in this collection.

On TILIACEAE.

Phyllachora Grewiae (Kalch.) Theiss. et Syd.

Ann. Myc. 13 (1915) p. 530.

Rhytisma Grewiae Kalch., Grevillea IX (1880) p. 32.

Stromata on brown indefinite leaf spots, visible on both sides of the leaf, scattered, round, 1-2 mm. diam., quite flat on the upper side of the leaf; flat on the lower side also, only slightly raised over the perithecia; with rough surface, black, somewhat shiny.

Clypeus epidermal, on both sides of the leaf, ca. 20-25 μ thick. Perithecia several in each stroma, globose or irregular, 150-300 μ diam., perithecial wall brown, 10-12 μ thick. Asci cylindrical-clavate, 50-60 \times 12-15 μ , 8-spored, paraphysate. Spores distichous, fusiform, apparently 1-celled and hyaline, 20-23 \times 4-5.5 μ .

On *Grewia occidentalis*, Herb. Kew.

"South African Fungi" in Grevillea (l.c.) includes fungi collected by Medley Wood at Inanda as well as a number of MacOwan's Cape collections, and the locality is often not given. Judging by the sequence of the numbers quoted, however, this is probably *Medley Wood 106*.

This specimen was not available for study and the description is taken from that of Theissen and Sydow (l.c.). They remark that the type specimen is not mature and that there is some doubt whether the spores will remain 1-celled and hyaline.

On MALVACEAE.

Phyllachora minuta P. Henn.

Hedwigia 41 (1902) p. 143; Theiss. and Syd., Ann. Myc. 13 (1915) p. 531; Doidge,

Bothalia 2 (1927) p. 231.

Not on leaf spots, or stromata grouped on small reddish brown or yellowish brown indeterminate leaf spots 1-1.5 mm. diam. Stromata amphigenous, visible on both sides of the leaf, minute, black, convex, circular in outline, 0.3-0.6 mm. diam., often in groups of 4-12 and not infrequently becoming confluent.

Clypeus epidermal, on both sides of the leaf, black, opaque, mostly 20-40 μ thick; usually not extending far beyond the perithecia, but often fusing with clypeus of neighbouring stromata; on the under side, the stellate hairs on the epidermis often become discoloured and brown. Stroma in the mesophyll consists of more or less closely reticulate pale fuscous or hyaline hyphae.

Perithecia solitary or few in each stroma, deeply immersed and occupying the whole thickness of the mesophyll, globose, flattened globose or flask-shaped, 250-350 μ diam., 200-350 μ high. Ostiole flat, papilliform, completely immersed in the clypeus, periphysate. Perithecial wall delicate, purplish brown, ca. 10 μ thick, concentric fibrose, indistinctly cellular, closely appressed to the cells of the host and often inconspicuous. Asci cylindrical to clavate, 8-spored, sp. part 65-100 \times 12.5-15 μ , rounded above, tapering below to a short stalk. Spores monostichous or incompletely distichous, hyaline, continuous, ellipsoid or ovate, rounded at both ends, often broader near the upper end and tapering more or less downwards, 14-17.5 \times 6-10 μ . Paraphyses breaking down early.

On *Hibiscus tiliaceus* L., on leaves, Port Shepstone, *Pole Evans*, 5604; near Durban, *van der Byl* 227, 32450.

This species was originally described by Hennings on a *Hibiscus* sp. collected in Java. Theissen and Sydow record it on *Hibiscus tiliaceus* and *Thespesia populnea* from Java, the Philippines and Australia.

On STERCULIACEAE.

Phyllachora Burgessiae Doidge nov. spec.

Stromata sine maculis, amphigena vel petiolicola, plerumque epiphylla in una folii pagina tantum praesentia, subinde autem opposita, sparsa, ambitu irregularia, primitus minuta, usque 2 mm. diam., dein majora saepeque secus folii venas elongata et usque 5 mm. longa, fortiter convexa, atra, in epiphyllis nitida, in hypophylo opaca atra; clypeo epidermali et subepidermali supra perithecia fortissime evoluta, opaca atro, carbonaceo, usque 95 μ crasso; clypeo in hypophylo parce evoluta vel, si magis evoluta, haud continuo; perithecia 2 vel numerosa in quoque stromate, profunde immersa, subglobosa vel e pressione

plus minus irregularia, 150–230 μ diam., 230–280 μ alta, ostiolo plano papilliformi, clypeo omnino immerso, periphysato, poro rotundato ca. 15 μ lato aperto; pariete atro vel atrobrunneo, opaco, concentricae fibrosae, 12.5–25 μ crasso; asci paraphysati, 8-sporei, cylindracei, 75–90 \times 10–11.5 μ . Sporae monostichae, hyaline, continuae, ellipsoideae, 10–12.5 \times 5–6.3 μ .

Hab. in foliis *Dombeyae Burgessiae*, Cloudlands, prope Umtali, Rhodesia, leg. Mogg, 30149.

Not on leaf spots, but causing some reddish brown discoloration of the leaf tissues in the immediate vicinity of the stromata. Stromata amphigenous and petiolicolous, mostly epiphyllous, usually only on one side of the leaf, but sometimes developing opposite to one another, scattered, irregular in outline; at first small, up to 2 mm. diam., later increasing in size, frequently becoming elongated along the veins and up to 5 mm. long; strongly convex, black, shining on the upper leaf surface, dull black on the under surface.

The leaf, which is normally about 80 μ thick, is up to 450 μ thick in areas where stromata have developed. Clypeus over the perithecia developing in epidermal and subepidermal cells, massive, opaque, black, carbonaceous, up to 95 μ thick, not extending more than 100 μ beyond the perithecia; sometimes a similar clypeus is formed below the perithecia, but often it is comparatively poorly developed. Stroma in mesophyll consists of brown to subhyaline, branched, more or less closely reticulate hyphae 2.5–5 μ thick, permeating the cells under the clypeus but not extending much beyond it; the invaded cells become discoloured and dead.

Perithecia 2 to numerous in each stroma, deeply immersed and often with base on the opposite epidermis, globose, flattened globose or irregular, 150–230 μ diam., 230–280 μ high. Ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with a circular pore ca. 15 μ broad. Perithecial wall stout, well developed, blackish brown, opaque, 12.5–25 μ thick, concentric fibrose, composed of brown hyphae ca. 2.5 μ thick. Asci paraphysate, 8-spored, cylindrical, 75–90 \times 10–11.5 μ . Spores monostichous, hyaline, continuous, ellipsoid, 10–12.5 \times 5–6.3 μ .

On *Dombeya Burgessiae* Gerr., Woodbush, Doidge, 17732 and ?1762; Cloudlands, near Umtali, S. Rhodesia, Mogg, 30149, Type.

Dombeya pulchra N.E.Br., Nelspruit, Liebenberg, 29917.

No. 1762 was cited in Bothalia I (1921) p. 28, as *Phyllachora Dombeyae* Syd. It is on *Dombeya Burgessiae* not on *D. Schimperiana* as stated, and the stromata are probably those of *Phyllachora Burgessiae*; the stromata are very old, showing neither asci nor spores. Most of the perithecia are empty, but in some there are conidia which possibly belong to a fungus parasitic in the stroma.

***Phyllachora Dombeyae* Syd.**

Ann. Myc. 15 (1917) p. 532; Doidge, Bothalia I (1921) p. 28.

Physalospora Dombeyae Syd., Ann. Myc. 10 (1912) p. 441.

Stromata epiphyllous, grouped on poorly defined, yellowish brown leaf spots which are more or less circular in outline and up to 5 mm. diam., but are often numerous and coalesce to form larger, irregular brown areas; the discoloration of the tissues is visible also on the under side of the leaf. Stromata round, 0.3–0.5 mm. diam., slightly convex, black, rather shiny, not visible on the under side of the leaf, or visible only as minute, dull black specks.

Clypeus well developed in the upper epidermis, but usually not extending beyond the perithecia, brownish black, opaque, 40–50 μ thick; when the base of the perithecium is near the lower epidermis, a short clypeus ca. 25 μ thick is formed below the perithecium. Stroma in the mesophyll poorly developed.

Perithecia 1 or few in each stroma, more or less deeply immersed, mostly globose, sometimes compressed laterally and then oval or oblong 130–220 μ diam., 150–220 μ high. Ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with a round pore 15–20 μ broad. Perithecial wall rather weak and poorly defined, pale golden brown to subhyaline, concentric fibrose, closely appressed to the cells of the host. Asci copiously paraphysate, clavate, rounded at the apex, 8-spored, 60–75 \times 15–20 μ . Spores distichous to tristichous, continuous, hyaline, ellipsoid, tapering somewhat to the rounded ends, asymmetrical, straight or slightly curved, 25–35 \times 3–4.5 μ .

Conidia also present, in pycnidia similar in form to the perithecia, filiform, curved in various ways, often uncinata, continuous, hyaline, 18–26 \times 1–1.5 μ .

On *Dombeya rotundifolia* Planch., on leaves, Equeefa, Zululand, Fuller, 1539, Type; Tzaneen, Liebenberg, 30962.

Dombeya pulchra N.E.Br., Nelspruit, Liebenberg, 26003.

On OCHNACEAE.

Phyllachora microstegia Syd.

Ann. Myc. 22 (1924) p. 430.

Stromata amphigenous, not on leaf spots but usually causing some yellowish brown discoloration of the leaf tissues. Stromata set closely and fairly evenly in groups, which are more or less extensive, irregular in shape, 0.5–2 cm. long. Stromata always discrete, very minute, punctiform, raised and convex on both leaf surfaces, 120–200 μ diam.

Epidermal clypeus amphigenous, blackish brown, opaque, 10–15 μ thick, obscurely parenchymatous. Stroma in mesophyll not conspicuous.

Perithecia usually solitary, rarely two are crowded under one clypeus, globose or flattened globose, 120–174 μ diam., 120–150 μ high. Ostiole flat or very slightly raised, papilliform, completely immersed in the clypeus, with a round pore ca. 15 μ broad. Perithecial wall fairly well defined, light brown, 10–12 μ thick, concentric fibrose, indistinctly cellular. Asci paraphysate, cylindrical or cylindrical clavate, 8-spored, 50 \times 8–12 μ . Spores monostichous, ellipsoid, hyaline, continuous, rounded at both ends, 9–11 \times 5 μ .

On *Ochna Holstii* Engl., Woodbush, Northern Transvaal, van der Byl 1498, 20448 (portion of Type, ex Herb. Sydow).

On FLACOURTIACEAE.

Phyllachora Aberiae P. Henn.

Engl. bot. Jahrb. 41 (1908) p. 272; Theissen and Sydow, Ann. Myc. 13 (1915) p. 534;

Doidge, Bothalia I (1921) p. 29.

Often causing a vague, yellowish brown discoloration of the leaf tissues, which is usually more conspicuous on the under side of the leaf; occasionally on definite, light brown leaf spots. Stromata mostly epiphyllous, but often visible also on the under side of the leaf, scattered or more or less closely grouped; very frequently secondary stromata develop in a concentric ring round an older stroma, sometimes fusing in a more or less complete circle and thus forming round groups 3–4 mm. diam. Single stromata more or less circular in outline, 0.5–1 mm. diam., black, somewhat shining, slightly convex.

Clypeus amphigenous, but better developed and more extensive in the upper epidermis, where it is blackish brown, opaque, continuous, 25–35 μ thick. Stroma in the mesophyll, between the base of the perithecia and the lower clypeus composed of brown, branching, more or less closely reticulate hyphae 2.5–3 μ thick; elsewhere it is pale and inconspicuous.

Perithecia several in each stroma, deeply immersed, subglobose, 240–270 μ diam., to flask-shaped, 180–220 μ diam., and 240–300 μ high. Ostiole papilliform, flat, completely immersed in the clypeus, periphysate, with a round pore ca. 10 μ broad. Perithecial wall dark brown, firm, 20–30 μ thick, concentric fibrose, consisting of hyphae 2.5–3 μ thick, often more or less distinctly cellular. Asci copiously paraphysate, numerous, 8-spored, straight or curved, sp. part ellipsoid, tapering somewhat to a rounded apex, rarely cylindrical, 75–90 \times 12–20 μ ; attenuated below into a stalk which is usually short, 8–10 μ long, but occasionally up to 22 or 30 μ long. Spores monostichous or incompletely distichous, often more or less imbricate, cylindrical and obtuse at both ends, or subclavate; rounded at the upper end, hyaline, continuous, 25–35 \times 4.5–6 μ ; thick-walled, wall ca. 1 μ thick.

On *Dovyalis caffra* Warb. (= *Aberia caffra*), on leaves, Uitenhage, Lounsbury, 202, 224 (Type collection) and Pienaar, 2420; Driefontein, Zoutpansberg, Doidge, 1813.

On MYRTACEAE.

Phyllachora capensis Doidge nov. comb.

Scotocodithis capensis Doidge, Bothalia I (1921) p. 27.

Not on leaf spots. Stromata epiphyllous, scattered, more or less circular in outline, 1–1.5 mm. diam., black, shining, convex, occasionally becoming confluent and producing larger, irregular, compound stromata. Smaller stromata observed on the under side of the leaf where usually flat and sterile or ? producing conidia; no perithecia were observed in these.

Clypeus originating in the epidermis, massive, black, opaque, 90–100 μ thick; between the arched clypeus and the palisade cells of the leaf, around the perithecia, the stroma is often subopaque, composed of brown, thin-walled cells, more or less vertical and prosenchymatous, or irregularly parenchymatous in structure. Stroma in the mesophyll is

represented by a few brown hyphae 2-5 μ thick; these are sometimes connected with the sterile stroma on the under side of the leaf.

Perithecia usually solitary in individual stromata, up to 4 or 5 in compound stromata, ellipsoid to lenticular or somewhat irregular through lateral pressure, with flat or slightly concave base pressing against the palisade cells of the host, 550-650 μ diam., 200-250 μ high. Ostiole flat, papilliform, periphysate, completely immersed in the clypeus. Perithecial wall ca. 10 μ thick at the base, consisting of a few layers of delicate, dark brown hyphae; at the sides merging with the hyphae forming the stroma and not clearly differentiated. Asci paraphysate, 8-spored, narrow-ellipsoid, tapering to both ends, pedicellate, 100-120 \times 13-14 μ . Spores parallel, hyaline or slightly tinted at maturity, narrow-fusiform, tapering to both ends, 60-70 μ long, 5-6 μ thick in the centre. Paraphyses disappearing early.

On *Eugenia Zeyheri* Harv., on leaves, Howieson's Poort, Doidge, 10963, 12379; Van Standen's Pass, Doidge, 10869.

Eugenia zuluensis Dümmer, Highbury, Natal, Doidge, 33151.

This fungus was originally described as a *Scolecodothis* (l.c.), the *Phyllachoraceae* genus in Theissen and Sydow's classification with *Catacauma*-like stroma, paraphysate asci and 1-celled filiform spores. The proportion of the length of the spores to their breadth is approximately 12 : 1 and they are therefore too stout to be regarded as filiform. Clements (1, p. 9) suggests that a ratio of 20 : 1 in the *Sphaeriales* should be regarded as the most natural dividing line.

The host was wrongly identified as *Olea foveolata*.

***Phyllachora goyazensis* P. Henn.**

Hedwigia 34 (1895) p. 110.

Catacauma goyazense (P. Henn.) Theiss. et Syd., Ann. Myc. 13 (1915) p. 396; Doidge, Bothalia II (1927) p. 231.

Not on definite leaf spots, but the leaf tissues around the stromata often show a light brown discoloration. Stromata epiphyllous, small, black, shining, convex, round to angular in outline, usually becoming confluent in groups which are very irregular in form. Groups often numerous and thickly set on the leaf surface.

Clypeus originating in the epidermis, massive, black, opaque, 60-75 μ thick, often fusing with the clypeus of adjoining stromata and extending over the compound stroma. Stroma between the arched clypeus and the palisade cells of the leaf, around the stromata, dark purplish brown, subopaque, indistinctly vertical and prosenchymatous in structure. Stroma in the mesophyll poorly developed.

Perithecia mostly distant, solitary, flattened globose to lenticular with concave base pressing against the palisade cells of the leaf, 400-500 μ diam., 220-300 μ high. Ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with a pore ca. 25 μ broad. Perithecial wall light to dark brown, concentric fibrose, at the base closely appressed to the cells of the host and ca. 10 μ thick, at the sides not sharply defined and merging with the hyphae forming the stroma. Asci paraphysate, 8-spored, cylindrical, 75-85 \times 12-15 μ . Spores monostichous, hyaline, continuous, ellipsoid, rounded at both ends, 13-16 \times 6-8 μ . Paraphyses numerous, hyaline, filiform.

On *Eugenia natalitia* Sond., on leaves, Kentani, Pegler 2110, 9113; ? Natal, Medley Wood 599, 10701.

Very little material of this fungus is available; it agrees closely with the description of the South American species *Phyllachora goyazensis*, but further collections are desirable and should be compared with authentic specimens of *Ph. goyazensis* when opportunity offers.

Medley Wood's collection is under the name *Rhytisma eugeniacearum*; no author is mentioned and no description has been found of such a species. The material is old, but is on the same host as the Kentani collection and is apparently identical with it.

***Phyllachora Peglerae* Doidge nov. comb.**

Catacauma Peglerae Doidge, Bothalia I (1921) p. 25.

Not on leaf spots. Stromata epiphyllous, 1-2 mm. diam., circular in outline, convex, conical, black, shining, often in groups and becoming confluent, forming larger, irregular compound stromata. A single stroma or group of stromata is often surrounded by a ring of secondary stromata at a radius of 2-5 mm.; the latter may be small and discrete or fuse to form a continuous ring.

Clypeus only on the upper side of the leaf, originating in the epidermis and becoming arched over the perithecia, massive, black, opaque, ca. $30\ \mu$ thick over the sterile part of the stroma, varying from $50\text{--}100\ \mu$ thick over the perithecia. Stroma between the perithecia and forming a sterile border round them under the extended clypeus, greyish brown to olive brown, pale near the margin, dark and subopaque near the perithecia, indistinctly parenchymatous in structure; the clypeus extends to a radius of $500\ \mu$ beyond the perithecia. Stroma in the mesophyll poorly developed.

Perithecia solitary or several in each stroma, lenticular to broadly flask-shaped, $400\text{--}600\ \mu$ diam., $350\text{--}500\ \mu$ high, with slightly concave base pressing against the palisade cells of the leaf. Ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with a round pore $15\text{--}20\ \mu$ broad. Perithecial wall thin, ca. $10\ \mu$ thick, at the base, closely appressed to the cells of the host, consisting of a few layers of indistinctly septate, subhyaline to olive brown hyphae ca. $2.5\ \mu$ thick; at the sides the wall is not sharply defined, merging outwardly with the hyphae forming the stroma. Asci 8-spored, clavate-cylindrical, sp. part $120\text{--}140 \times 17\text{--}20\ \mu$, with a short stalk $10\text{--}13\ \mu$ long. Spores monostichous or incompletely distichous, continuous, hyaline, oval to ellipsoid, rounded at both ends, $20\text{--}23 \times 12\text{--}13\ \mu$.

Pycnidia usually present in the same stromata, closely associated with the perithecia and often interspersed with them, narrow lenticular or irregular in form, $400\text{--}600\ \mu$ diam., $100\text{--}150\ \mu$ high, covered by the epidermal clypeus. Conidia very numerous, produced on palisade-like conidiophores at the base of the pycnidium, hyaline, fuscous in mass, filiform, curved, ca. $20\text{--}25\ \mu$ long and $0.5\ \mu$ thick.

On *Eugenia capensis* Harv., on leaves, Kentani, Pegler 2340, 9099, Type; Umbogintwini, Natal, Doidge, 6636; Scottsburgh, Pole Evans, 6841; Warner Beach, Bottomley, 11667.

Phyllachora Woodiana Doidge nov. spec.

Sub *Phyllachora gentilis* Speg. in Herb. Medley Wood.

Stromata sine maculis, amphigena, plerumque epiphylla, sparsa, opace atra, ambitu orbicularia vel elliptica, ca. 1 mm. diam. vel usque 1.5×1 mm.; clypeo in utraque folii pagina evoluta, atro, opaco, $50\text{--}80\ \mu$ crasso; stromate in mesophyllo ex hyphis reticulato-contextis, hyalinis, ca. $1.5\ \mu$ crassis contexto. Perithecia plerumque complura, plus minus stipata, globosa, depresso-globosa vel ovata, saepe valde irregularia, $250\text{--}400\ \mu$ diam., $200\text{--}250\ \mu$ alta, ostiolo plano, papilliformi v. obtuse conico, clypeo omnino immerso, periphysato praedita; pariete perithecii ca. $10\text{--}15\ \mu$ crasso, subhyalino, concentric fibroso. Asci numerosi, 8-sporei, cylindracei, apice rotundati, breviter pedicellati, $80\text{--}100 \times 6\text{--}7.5\ \mu$. Sporae (vix maturae) monostichae, ellipsoideae, utrinque rotundatae, hyalinae, continuae, $12.5\text{--}15 \times 5\text{--}6\ \mu$.

Hab. in foliis *Eugeniae capensis*, prope Durban, leg. Medley Wood, 9477 (Medley Wood 6462).

Not on leaf spots. Stromata amphigenous, mostly epiphyllous, visible also on the opposite side of the leaf, scattered, raised, disc-like, dull black, round, ca. 1 mm. diam. or somewhat elongated and up to 1.5×1 mm.

Clypeus over the perithecia in the epidermal and subepidermal cells black, opaque, $50\text{--}80\ \mu$ thick; sometimes not so well developed and not continuous in the opposite epidermis. Stroma in the mesophyll consists of fine hyaline hyphae, ca. $1.5\ \mu$ thick, more or less closely reticulate and permeating the cells of the host.

Perithecia several in each stroma, deeply immersed, often crowded together and in contact laterally; occasionally stromata develop opposite to one another on either side of the leaf and the perithecia are apparently in two series, somewhat compressed and irregular in form. Perithecia usually globose, flattened globose or ovate, $250\text{--}400\ \mu$ diam., $200\text{--}250\ \mu$ high. Ostiole flat, papilliform or bluntly conical, completely immersed in the clypeus, lined within with short, filiform, hyaline periphyses. Perithecial wall pale yellow brown to subhyaline, ca. $10\text{--}15\ \mu$ thick, delicate, concentric fibrose. Asci numerous, paraphysate, 8-spored, cylindrical, rounded above, tapering below to a short foot, $80\text{--}100 \times 6\text{--}7.5\ \mu$. Spores monostichous, ellipsoid, rounded at both ends, hyaline, continuous, $12.5\text{--}15 \times 5\text{--}6\ \mu$. (Asci and spores are barely mature).

On *Eugenia capensis* Harv., on leaves, near Durban, Medley Wood 6462, 328, 9477.

According to Theissen and Sydow (Ann. Myc. 13, 1915, p. 567) the type of *Phyllachora gentilis* has no clypeus and is therefore not a *Phyllachora*; it is evidently not identical with the fungus described above.

On MYRSINACEAE.

Phyllachora myrsinicola Doidge.*Boothalia* I (1921) p. 81.

Not on leaf spots nor causing any marked discoloration of the leaf tissues. Stromata epiphyllous, scattered, usually remote from one another, rarely contiguous and becoming fused, round, only slightly raised, disk-like, not convex, 0.5–1 mm. diam., black, somewhat shiny.

Clypeus only on the upper side, blackish brown, opaque, formed of parenchymatous cells 4–6 μ diam., 18–25 μ thick over the mesophyll between the perithecia, 30–40 μ thick over the perithecia. Stroma well developed in the upper part of the mesophyll, where the cells of the host are permeated by a more or less close stroma tissue, more or less closely parenchymatous and brown under the clypeus and often immediately below the perithecia, becoming paler and looser in texture below, formed of hyphae 4–6 μ thick.

Perithecia several in each stroma, immersed, occupying about half the thickness of the leaf, which in areas occupied by the stroma is distended to about twice its normal thickness, not closely crowded, often remote from one another, globose or flattened globose, 100–240 μ diam. Ostiole flat, papilliform, sparsely periphysate, immersed in the clypeus, with a rather indefinite pore 20–30 μ broad. Perithecial wall not well defined, pale, concentric fibrose, ca. 10 μ thick. Asci numerous, completely filling the perithecial cavity, 8-spored, clavate, broadly rounded above, tapering more or less downwards to a short foot, 80–100 \times 20–27 μ , thick-walled. Spores distichous, hyaline, continuous, ellipsoid or more or less rhomboid, 16.5–23.5 \times 9–10 μ . Paraphyses rather sparse, disappearing early.

On *Myrsine melanophleos* R. Br. (= *Rapanea melanophleos* Mey.), on leaves, Duncairn, near Maritzburg, Doidge, 15015, Type; Greytown, Doidge, 15530; Howieson's Poort, near Grahamstown, Doidge, 12376; Woodbush, northern Transvaal, Doidge, 1756; Noetse, Knysna District, van der Byl 2287.

On SAPOTACEAE

Phyllachora Baumii P. Henn.

Ergebnisse der Kunene-Sambesi Exped. (1902) p. 166; Theiss. and Syd., Ann. Myc. 13 (1915) p. 546.

Stromata arranged in circles near the periphery of round or elliptic leaf spots, which are sharply defined, 3–7 mm. diam., silver grey on the upper side of the leaf and dark brown on the under side. The Stromata are always near the margin of these spots and are visible on both sides of the leaf. At first the leaf spots are not bordered, but later are defined by a distinct brown or black line; when infection is heavy, numerous spots run into one another and form extensive, fantastically lobed areas bordered by a single common black line.

Stromata round, disk-like, 0.5 mm. diam. Perithecia solitary in each stroma, globose, 330–360 μ diam., occupying the whole of the mesophyll of the leaf; perithecial wall thin, greyish brown, consisting of rather loosely interwoven stromatal hyphae and fusing above and below with the epidermal clypeus. Ostiole always opening toward the under side of the leaf, where the clypeus is usually somewhat shorter and thinner than on the upper side. Asci paraphysate, oblong-clavate, 90–105 \times 8–10 μ . Spores oblong, fusiform or sub-clavate, continuous, hyaline, 15–18 \times 5–7 μ .

On *Sideroxylon* sp., on leaves, Jau, S.W. Africa, Baum 1002.

There has been no opportunity of studying this fungus and the description is taken from that of Theissen and Sydow (l.c.).

Phyllachora placida (Syd.) Theiss.

Ann. Myc. 14 (1916) p. 424.

Physalospora placida Syd., Ann. Myc. 7 (1909) p. 544.

Stromata visible on both sides of the leaf, more or less round, 2–3.5 mm. diam., dull black or blackish brown, flat, slightly raised and convex over the perithecia and more prominently so on the upper than the under surface; surrounded by a definite, raised reddish brown or purplish brown zone about 0.5 mm. broad of discoloured leaf tissue.

Upper clypeus extensive, filling the epidermis which consists of 2 layers of cells, 25–30 μ thick, black, opaque; the cuticle, which is 6 μ thick remains intact over the clypeus; the lower clypeus is equally extensive, involving the epidermis and the subepidermal cells, but is irregular in thickness, 25–50 μ ; the structure is obscurely parenchymatous. The stroma permeates the mesophyll between the two clypeal plates and consists of more or less closely reticulate, branching, light brown to hyaline, hyphae, 2.5–4 μ thick.

Perithecia usually remote from one another, sometimes in rather close groups of 2-3, deeply immersed, with base near the upper clypeus, subglobose or somewhat flask-shaped, often somewhat broader than long, 250-440 μ diam., 220-300 μ high. Ostiole obtusely conical, immersed in the lower clypeus and with a rather indefinite pore 20-25 μ broad. Perithecial wall pale brown to hyaline, not well defined, concentric fibrose. Asci 8-spored, cylindrical or cylindrical-fusiform, rounded or tapering somewhat at the apex, briefly spiculate, 62-88 \times 11-15 μ . Spores distichous, subcylindrical or subclavate, rounded above, tapering somewhat to the base, straight, hyaline, 21-28 \times 4 μ . Paraphyses numerous, filiform, exceeding the asci.

On *Mimusops caffra* E. Mey., on leaves, Lourenço Marques, Howard, 669.

On BORRAGINACEAE.

Phyllachora caffra Syd.

Ann. Myc. 13 (1915) p. 548; Doidge, Bothalia 1 (1921) p. 27.

Phyalospora caffra Syd., Ann. Myc. 10 (1912) p. 39.

Stromata grouped on rusty brown leaf spots, which are irregular in form and not sharply defined, epiphyllous, convex, black, shining, round, 250-350 μ diam.; on the lower leaf surface the epidermis is raised and later the stroma becomes visible as a minute, dull black point.

Clypeus in the upper epidermis short, not extending beyond the single perithecium, brownish black, opaque, 20-50 μ thick; clypeus in the lower epidermis shorter and sometimes poorly developed. Stroma in the mesophyll sparse.

Perithecia solitary, deeply immersed and extending from the upper to the lower clypeus, globose, 250-300 μ diam. Ostiole flat, papilliform, completely immersed in the clypeus, periphysate, with a pore ca. 10 μ broad. Perithecial wall not well defined, hyaline or yellowish, concentric fibrose. Asci paraphysate, 8-spored, cylindrical, 75-90 \times 9-12 μ . Spores monostichous, broadly ellipsoid, hyaline, continuous, 11-13 \times 6-8 μ . Paraphyses filiform, exceeding the asci.

On *Cordia caffra* Sond., on leaves, Amanzimtoti, Doidge, 1631.

PHAECHORELLA Theiss. et Syd.

Phaeochorella Parinarii (P. Henn.) Theiss. et Syd.;

Ann. Myc. 13 (1915) p. 405; Doidge, Bothalia 1 (1921) p. 26.

Cocconia Parinarii P. Henn., Engl. bot. Jahrb. 3L (1901) p. 257.

Stromata always epiphyllous, scattered, round to irregular in outline, 1-6 mm. diam. the stromata on *Parinarium capense* usually being smaller than those on *Parinarium molle*, often very numerous, becoming crowded and occasionally confluent. When the stromata are remote from one another, an irregular ring of younger stromata often develops with the older stroma in the centre and a diameter of 8-12 mm. Stromata convex, up to 450 μ high, black, crustaceous, with rough, uneven surface.

Clypeus epidermal, black, carbonaceous, massive, 40-60 μ thick, originating in the epidermal cells and becoming arched over the perithecia, parenchymatous, formed of dark olive brown, round, angular or somewhat elongated cells ca. 5-8 μ diam. Stroma surrounding the perithecia, between the clypeus and the palisade cells of the leaf light brown, indefinite in structure, composed of more or less closely interwoven, branched hyphae, 2.5-4 μ thick. Stroma poorly developed in the mesophyll.

Perithecia several in each stroma, with flat or slightly concave base pressing against the palisade cells of the leaf, usually in close groups, flattened globose to flask-shaped, or irregular through mutual lateral pressure, 200-500 μ diam., 200-300 μ high. Ostiole flat, papilliform, completely immersed in the clypeus, sparsely periphysate, with an irregularly circular pore ca. 20-25 μ broad. Perithecial wall well developed, brown, 15-25 μ thick, concentric fibrose, consisting of rather delicate, indistinctly septate hyphae 2-2.5 μ thick. Asci paraphysate, 8-spored, cylindrical, 85-100 \times 11-15 μ , rounded above, tapering below to a short stalk. Spores monostichous, oblong, broadly rounded at both ends, continuous, dark brown with a narrow, hyaline medial zone, 12-17 \times 6-9 μ . Paraphyses fibrose, breaking down early.

On *Parinarium capense* Harv., on leaves, Pretoria, Doidge, 613, 1507, 2203, Erasmus, 1272 and Janse (van der Byl 1307); Natal, Pole Evans, 10981; Buffelspoort, near Marikana, Pallister, 17825; Wonderboom, near Pretoria, Schonland, 21983; Silverton Ridge, near Pretoria, Doidge, 23409; Daspoort, Pretoria, Kresfelder, 30817; Donkerpoort, near Pretoria, Doidge and Bottomley, 29729; Waterkloof Ridge, near Pretoria, Doidge, 29855; Nelspruit, Wager, 23411 and Liebenberg, 25497.

Parinarium ouratellifolium Planch., Magoeba's Kloof, 9173; also from East Africa, Stoltz 1545, 23410.

Parinarium mobola Oliv. Rhodesia, Howard, 730; Letaba Drift, Doidge, 1809; Rua River, near Salisbury, Eyles 1347, 23412 and van der Byl 2438; Louis Trichardt, Power, 30113; Zoutpansberg, van der Byl 2741; Mazoe, Eyles 5279 (van der Byl 2507); Woodbush, K. M. Putterill, 32750 and van der Byl 1526.

This fungus was originally described by Hennings (l.c.) from a collection on *Parinarium mobola* made by Goetze in "upper Kondeland", Tanganyika Territory. It is very common and widespread on *Parinarium* spp. in South Africa.

ENDODOTHELLA Theiss. et Syd.

EndodotHELLA Deightonii Syd.

Ann. Myc. 36 (1938) pp. 162-163.

Phyllachora Albizziae Cke., Grevillea XIII (1885) p. 65.

Dothidea vivensis var. *Albizziae* Cke., ibid.

Homostegia Albizziae (Cke.) Berl. et Vogl., in Sacc. Syll. Fung. IX, p. 1049.

sub *Phragmocaula vivensis* (Cke.) Theiss. et Syd., Ann. Myc. 13 (1915) p. 411; Doidge,

Bothalia I (1921) p. 27.

Stromata always hypophyllous, not on leaf spots, but causing some yellowish- or greenish-brown discoloration of the leaf tissues which is visible also on the upper side of the leaf. Stromata scattered irregularly over the leaf surface, small, circular to elliptic or angular and irregular, usually 0.5-1 mm. diam.; often numerous and becoming confluent, forming linear or branched, dendritic compound stromata, following the veins and up to 3 mm. long or only limited in length by the extent of the vein, ca. 0.3-0.5 mm. broad, dull black or slightly shiny, convex.

Epidermal clypeus 25-45 μ thick, formed of blackish brown, fibrose or microparenchymatous, almost opaque tissue. Stroma in the mesophyll poorly developed and consisting of a loose and indefinite network of hyphae, which are septate, 2-3 μ thick, subhyaline to pale yellowish or greyish brown.

Perithecia more or less deeply immersed in the mesophyll, one to many in each stroma, globose, flattened globose or irregular through mutual lateral pressure, 100-350 μ diam., 150-200 μ high. Ostiole flat, broad, papilliform, immersed in the clypeus, with a round pore 15-20 μ broad. Perithecial wall concentric fibrose, usually about 10-17 μ thick, pale olive brown at the base and the lower part of the sides, darker and thicker above and finally merging with the clypeus. Asci numerous, cylindrical to cylindrical-clavate, obtuse above or tapering somewhat to the rounded apex, narrowed below abruptly or rather gradually to a short stalk usually about 5 μ long, but occasionally with a rather long stalk up to 30 μ long, 8-spored, rarely 4-6-spored, sp. part 75-100 \times 12-14 μ with a firm wall (fide Sydow 55-85 \times 8-14 μ thin-walled). Spores obliquely monostichous or imperfectly distichous, oblong or oblong-fusoid, rounded at both ends, usually somewhat asymmetrical, hyaline, 1-septate, not constricted, 20-27.5 \times 6-7.5 μ (fide Sydow 14-20 \times 4-5 μ); cells subequal or the upper slightly shorter (10-12.5 μ long) and the lower (12-15 μ long) tapering somewhat towards the base, thick-walled, wall ca. 1 μ thick. Paraphyses numerous, filamentous, ca. 1.5-2 μ thick, thin-walled.

On *Albizzia gummifera* (Gmel.) C. A. Smith (= *Albizzia fastigiata* Oliv.) on leaves, Inanda, Medley Wood 583, 9492, 10445, type collection of *Phyllachora Albizziae* Cke.; Winkle Spruit, Pole Evans, 1401, 1583; Stella Bush, Durban, Doidge, 1615; Verulam, Pole Evans, 6829; Umkomaas, Bottomley, 11889; Phoenix, Natal, Wager, 33097; Durban, van der Byl 209.

The Inanda collection, Medley Wood 583, was described by Cooke (l.c.) as *Phyllachora Albizziae* (Syn. *Dothidea vivensis* var. *Albizziae*) with the following details:—

"Epiphylla, minuta, convexa, nitida, vix 1 mm. diam., loculis paucis (1-4).

Asci clavatis, breviter stipitatis, sporidiis lanceolatis, medio constrictis, uniseptatis, binucleatis demum triseptatis, hyalinis, 0.25-0.27 \times .007 mm."

Medley Wood's fungus differs from this description in that the stromata are always hypophyllous. In a very large number of preparations examined, no 3-septate spores could be detected; they are always 1-septate and are not constricted.

Following Cooke, Theissen and Sydow identified this fungus with *Dothidea vivensis* from India, which they renamed *Phragmocaula vivensis*. Dr. Sydow recently examined a small portion of the type of the Indian fungus; the host differs from *Albizzia gummifera* and is possibly not an *Albizzia* sp., the stroma on this leaf is epiphyllous and is said to have

3-septate spores. It seems certain, therefore that the South African fungus is not identical with the Indian *Phragmocaulis vivensis*.

The spores are 2-celled and the fungus is an *Endodothella*, but the name *End. Albizziae* has been used by Sydow (Ann. Myc. 13, 1915, p. 590) for a Philippine species with much smaller stromata and spores.

The South African fungus agrees in every particular with the species on *Albizzia gummi-fera* from Sierra Leone described by Sydow as *End. Deightonii* except that the asci and spores are somewhat larger. It is probable that this is a somewhat variable species occurring throughout Africa on *Albizzia*.

***Endodothella natalensis* Doidge.**

Bothalia I (1921) p. 30.

Not on leaf spots, but causing some yellowish brown discoloration of the leaf tissues near the stromata. Stromata epiphyllous, minute, punctiform, about 0.3–0.5 mm. diam., black, shiny, somewhat convex, not infrequently becoming confluent and forming larger, compound stromata; on the under side of the leaf the epidermis is often discoloured and slightly raised, forming minute brown blisters.

Clypeus only in the upper epidermis, blackish brown, opaque, 30–40 μ thick, usually not extending beyond the perithecia, formed of dark olive brown, closely interwoven hyphae, 2–2.5 μ thick. Stroma in the mesophyll usually poorly developed except between the perithecia where it is rather closely reticulate or loosely parenchymatous; formed of olive brown hyphae 2.5–4 μ thick.

Perithecia 1–2, rarely 3, in each individual stroma, more in the compound stromata, deeply immersed, subglobose to ellipsoid, 240–320 μ diam., 190–240 μ high. Ostiole flat, conical-truncate, completely immersed in the clypeus, periphysate, with a round pore 10–20 μ broad. Perithecial wall dark brown, well developed, subopaque, 13–15 μ thick, concentric fibrose, composed of brown hyphae 2.5–3 μ thick. Asci paraphysate, 8-spored, ellipsoid or cylindrical, straight or curved, rounded above, narrowed below into a short stalk 6–7 μ long, 80–87 \times 15–17 μ . Spores distichous or obliquely monostichous, hyaline, 1-septate, not constricted, fusiform, tapering to obtuse ends, 20–23.5 \times 8.5–10 μ , thick-walled, wall 1.5–2 μ thick; cells subequal or the upper ca. 10 μ long, lower 10–13.5 μ long.

On *Dichrostachys glomerata* (Forsk.) Chiov., Winklé Spruit, Doidge, 2513, Type; Verulam, Pole Evans, 6833.

In the original description, the name of the host was incorrectly given as *Dalbergia armata*; a branch of this plant was mixed with the material, but the fungus is on *Dichrostachys*.

OPHIODOTHELLA v. Höhn.

***Ophiiodothella edax* (B. et Br.) v. Höhn.**

Fragm. Myk. 12 (1910) No. 630; Theiss. and Syd., Ann. Myc. 13 (1915) p. 613; Doidge, Bothalia I (1921) p. 32.

Dothidea edax B. et Br., Jour. Linn. Soc. (1873) p. 135.

Ophiodothis edax Sacc., Syll. Fung. II, p. 653.

Not on definite leaf spots, but causing rather extensive yellow discoloration of the leaf tissues. Stromata placed between the veins of the leaf in elongated groups up to 3 mm. long and 1 mm. broad; not infrequently an oval ring of younger stromata forms round an older group. Single stromata amphigenous, mostly epiphyllous, but visible also on the opposite side of the leaf, minute, punctiform, ca. 0.3 mm. diam., usually becoming confluent in groups.

Clypeus in the epidermis on both sides of the leaf, brownish black, opaque, often somewhat raised and bluntly conical over the apex of the perithecia, 20–30 μ thick in the upper epidermis, ca. 20 μ thick in the lower. Stroma in the mesophyll consists of rather loosely reticulate, branched, pale olive brown to hyaline hyphae 2.5–4 μ thick.

Perithecia 1–3 in each stroma, globose or flattened globose, deeply immersed, 150–250 μ diam., 150–200 μ high. Ostiole papilliform or truncate conical, completely immersed in the clypeus, periphysate. Perithecial wall subhyaline to light brown, 8–10 μ thick, concentric fibrose. Asci numerous, 8-spored, clavate-ellipsoid, pedicellate, 70–80 \times 10–13 μ . Spores parallel, filiform, continuous, hyaline, straight or curved, tapering somewhat to the blunt ends, 45–60 \times 3–3.3 μ . Paraphyses not seen.

On *Tephrosia elongata* E. Mey., on leaves, Olifantsfontein, Pienaar, 12822.

***Ophiodothella Liebenbergii* Doidge nov. spec.**

Stromata epiphylla, maculis dilute brunneis circularibus usque irregularibus usque 1 cm. diam. metientibus insidentia, maculis saepe numerosis et confluentibus, tunc magnam folii partem occupantibus; stromata in maculis plus minus dense dispersa, discreta vel 2-3 dense aggregata, atra, convexa, nitida, usque 0.3 mm. diam.; clypeo epidermali atrobrunneo, opaco, 20-25 μ vel usque 40 μ crasso, ultra perithecia haud extenso; stromate in mesophyllo parce evoluto hyalino. Perithecia solitaria, subglobosa, vel irregularia, profunde immersa, 160-250 μ diam., 150-180 μ alta, ostiolo brevi, late conoideo clypeo omnino immerso, copiose periphysato, poro plus minus rotundato 15-20 μ lato pertuso praedita; pariete perithecii parum perspicuo, 5-7.5 μ crasso, concentric fibroso, hyalino. Asci sat numerosi, 8-spori, ellipsoidei, antice rotundati, sessiles, recti v. leniter curvati, 65-75 \times 10-15 μ . Sporae parallelae, contortae, hyalinae, lineares, 50-62.5 μ longae, ad basim rotundatam vel truncatam 2.5-3 μ crassae, sursum sensim attenuatae, curvatae, continuae.

Hab. in foliis *Ochna pulchrae*, Hartebeestpoort, leg. Liebenberg, 30382.

On light brown leaf spots, which are circular to irregular in outline and up to 1 cm. diam., often numerous, becoming confluent and covering a large part of the leaf. Stromata epiphyllous, scattered on the leaf spots, discrete or in small, closely crowded groups of 2-3, black, convex, shining, minute, up to ca. 0.3 mm. diam.

Clypeus in the upper epidermis opaque, blackish brown, 20-25 μ thick, up to 40 μ thick over the apex of the perithecia, not extending beyond the perithecia, formed of closely interwoven, dark olive brown hyphae 2.5-4 μ thick. Stroma in the mesophyll composed of rather loosely reticulate hyaline hyphae.

Perithecia solitary, subglobose or somewhat irregular in form, deeply immersed in the mesophyll, 160-250 μ diam., 150-180 μ high; ostiole flat, truncate conical, immersed in the clypeus, periphysate, with a more or less round pore 15-20 μ broad. Perithecial wall delicate, hyaline, 5-7.5 μ thick, concentric fibrose, closely appressed to the cells of the host. Asci fairly numerous, 8-spored, ellipsoid, rounded at the apex, sessile, straight or somewhat curved, 65-75 \times 10-15 μ . Spores parallel, twisted, hyaline, continuous, linear, 50-62.5 μ long, 2.5-3 μ broad at the rounded or truncate base and tapering gradually to the apex, curved, usually more or less sinuous. Paraphyses sparse.

On *Ochna pulchra* Hook., on leaves, Hartebeespoort below the dam, Liebenberg, 30382, Type; The Willows, Pretoria District, Doidge and Bottomley, 29735; Meintjes Kop, Pretoria, Hean, 32801; The Kloof, Rustenburg, Hean, 31084.

DIACHORA J. Mull. emend. Petrak.

Ann. Myc. 22 (1924) p. 130.

Leaf parasites. Stroma extensive, delicate, permeating all the leaf tissues and defined on either side by a parenchymatous "rind" in the epidermis; within, the stroma is sclerotial, hyaline or subhyaline. Perithecia completely and permanently immersed in the stroma, rather remote from one another, only the ostiole erumpent; ostiole papilliform or truncate-conical. Perithecial wall more or less parallel-fibrose, rather light coloured, weakly membranous, almost fleshy. Asci very delicate, cylindrical, sessile or briefly pedicellate, 8-spored. Spores ellipsoid or ovate, 1-celled, hyaline, of medium size.

Petrak (l.c.) states that the genus *Diachora*, of which the species are found on Leguminosae, is intermediate between *Physalosporina* and *Phyllachora*, and that it affords an indication that the true *Phyllachora* spp. must have developed from *Physalosporina*-like forms. The position of the genus is ambiguous, but it is included here with the *Phyllachoraceae*.

***Diachora Lessertiae* (Doidge) Petr.**

Ann. Myc. 32 (1934) p. 349.

Phyllachora Lessertiae Doidge, Bothalia I (1921) p. 30.

Stroma extensive, usually penetrating right through the leaf, which becomes distended to a thickness of 300-700 μ ; it also develops on the petioles and stems, encircling them and spreading more or less extensively. The leaf tissues are discoloured light brown; greyish black or brownish black spots develop round the ostioles of the perithecia, and these often coalesce so that the greater part of the leaf surface appears black.

Ground tissue of the stroma sclerotial, plectenchymatous, consisting of thick-walled hyphae 4-6 μ thick, irregularly and very freely branched and interwoven. Over the perithecia and in their vicinity the stroma tissue is coloured more or less dark olive brown.

Perithecia scattered irregularly, but seldom single, usually in closely crowded groups of 2-4 and more or less coalescent, sometimes quite fused, rather deeply immersed, globose, broadly ellipsoid or ovate, often flattened laterally through mutual pressure and irregular, ca. 160-280 μ diam., narrowing above into a thick, truncate-conical ostiole, which is punctiform-erumpent, with an irregularly round pore. Perithecial wall weakly membranous to fleshy, ca. 15-25 μ thick, consisting of numerous layers of closely compressed cells, hyaline or pale at the base and sides, with cells ca. 8-16 μ diam., pellucid olive brown near the apex and formed of smaller dark brown cells; usually not sharply defined externally and merging with the stroma tissue. Asci numerous, cylindrical to sub-clavate, broadly rounded above, narrowed below into a short stalk, 8-spored, thin-walled, sp. part 70-90 \times 12-17 μ . Spores monostichous or incompletely distichous, ellipsoid or ovate, broadly rounded at both ends, continuous, hyaline, 10-15 \times 5-6.5 μ . Paraphyses rather sparse, broadly filamentous, very thin-walled, ca. 3-4 μ thick.

On *Lessertia depressa* Harv., on leaves and stems, Smitskraal, Burt Davy, 1568, Type. *Lessertia perennans* D.C., Mooi River, Natal, Mogg, 17038.

Lessertia stricta Bolus, Nottingham Road, McClean, 32285.

The host of the type collection was wrongly named; it is *Lessertia depressa* not *L. tenuifolia*.

SPECIES EXCLUDENDAE VEL DUBIAE.

A number of South African fungi previously included in the Phyllachoraceae have not been described in this paper and the reasons for their exclusion are set forth in the following notes.

Coccochora Lebeckiae Verw. et Dipp.

S. Afric. Jour. Sci. 27 (1930) p. 328.

On *Lebeckia Candolleana*, Stellenbosch, van der Byl 389 and Gordon's Bay, Loseby (van der Byl 2590).

This fungus, which is described accurately and in detail by Verwoerd and Dippenaar (l.c.) is an Aphysa and may be called *Aphysia Lebeckiae* (Verw. et Dipp.) Doidge.

Dictyochorella Andropogonis Doidge.

Bothalia I (1922) p. 66.

The muriform spores described belong to *Pleospora Doidgeae* Petr. (Ann. Myc. 25, 1927, pp. 293-295) which is parasitic in a phyllachoroid stroma. The host is probably *Phyllachora Doidgeae* Syd. on *Cymbopogon* sp. See also Bothalia IV (1941) p. 212.

Oligostroma maculiformis (Wint.) Doidge.

Bothalia I (1921) p. 31.

Didymella maculiformis Wint., Hedwigia 23 (1884) p. 169; Rabh. Wint. Fung. Eur. 3056.

Oligostroma Proteae Syd., Ann. Myc. 12 (1914) p. 265 and 13 (1915) p. 592; Petrak, Ann. Myc. 22 (1924) p. 116.

On *Protea grandiflora* Thunb., near Cape Town, MacOwan, 3396 (Rabh. Fung. Eur. 3056).

Protea Flanaganii Phil., Kentani, Pegler, 5163, 5618, type collection of *O. Proteae*.

This fungus is common throughout South Africa on *Protea* spp. The genus is excluded from the Phyllachoraceae by Petrak (l.c.). He disagrees with v. Höhnelt's view (Ber. Deutsch. bot. Ges. XXXV, 1917, p. 629) that *Oligostroma* is closely related to *Endodothella* and states that it stands in close relationship to *Didymella* and *Mycosphaerella* and is a genus of the true Dothideales in the broad sense, the Phyllachoraceae being now regarded as belonging to the Sphaeriales.

Phaeodothis stenostoma (Ell. et Tr.) Th. et Syd.

Ann. Myc. 13 (1915) p. 596; Doidge, Bothalia I (1922) p. 66.

On *Panicum maximum* Jacq., Bluff, Durban, Doidge, 1611.

The type specimen of this fungus has not been seen, but the South African specimens identified as *Phaeodothis stenostoma* (Doidge l.c.) are *Cryptodidymosphaeria clandestina* Syd., which is parasitic in the stroma of *Phyllachora heterospora*. See also Bothalia IV (1941) p. 206.

Phaeodothis Tristachya Syd.

Ann. Myc. 10 (1912) p. 41; Theissen and Sydow, Ann. Myc. 13 (1915) p. 595; Doidge, Bothalia I (1922) p. 67.

On *Tristachya hispida* Schum., on leaves, Mooi River, Natal, Burt Davy, 1470.

<i>Dothideaceae</i>	421	<i>Moraceae</i>	440
<i>Dothidea crotinata</i>	448	<i>Musaceae</i>	439
<i>Crotonis</i>	448	<i>Myrsinaceae</i>	455
<i>edax</i>	458	<i>Myrsine melanophleas</i>	455
<i>graminis</i>	435	<i>Myrtaceae</i>	452
<i>Kniphofiae</i>	461	<i>Ochnaceae</i>	452
<i>lucens</i>	449	<i>Ochna Holstii</i>	452
<i>Melanthi</i>	449	<i>pulchra</i>	459
<i>puncta</i>	445	<i>Oligostroma maculiformis</i>	460
<i>repens</i>	443	<i>Protea</i>	460
<i>Strelitziae</i>	439	<i>Ophiodothella</i>	422
<i>viventis</i> v. <i>Albizziae</i>	457	<i>Ophiodothella edax</i>	458
<i>Dovyalis caffra</i>	452	<i>Ophiodothella Liebenbergii</i>	459
<i>Elyonurus argenteus</i>	425	<i>Panicaceae</i>	432
<i>glaber</i> v. <i>villosus</i>	424, 425	<i>Panicum deustum</i>	435
<i>Endodothella</i>	422	<i>maximum</i>	435, 460
<i>Endodothella Albizziae</i>	458	<i>minus</i>	433
<i>Deightonii</i>	457	<i>Stapfianum</i>	433
<i>natalensis</i>	458	<i>Parinarium capense</i>	456
<i>Strelitziae</i>	439	<i>curatellifolium</i>	457
<i>Eragrostaceae</i>	430	<i>mobola</i>	457
<i>Eragrostis</i>	431	<i>Parodiella circinata</i>	448
<i>Eragrostis curoula</i>	430, 431	<i>puncta</i>	445
<i>gangetica</i>	431	<i>Paspalum scrobiculatum</i>	435
<i>Lehmanniana</i>	431	<i>Peltophorum africanum</i>	446
<i>superba</i>	431, 444	<i>Pennisetum Benthami</i>	436
<i>Eugenia capensis</i>	454	<i>macrourum</i>	436
<i>natalitia</i>	453	<i>purpureum</i>	436
<i>Zeyheri</i>	453	<i>setosum</i>	436
<i>zuluensis</i>	453	<i>sphacelatum</i>	436
<i>Euphorbiaceae</i>	448	<i>Perotis indica</i>	439
<i>Festuceae</i>	431	<i>Phaeochora Neowashingtoniae</i>	422
<i>Ficus</i>	421, 440	<i>Phaeochorella Parinari</i>	422, 456
<i>Ficus Burkei</i>	442	<i>Phaeodthis stenostoma</i>	460
<i>Burt-Davyi</i>	442	<i>Tristachya</i>	460
<i>capensis</i>	440, 441, 442	<i>Phaseolus</i>	448
<i>carica</i>	442	<i>Phragmocauma viventis</i>	457
<i>Hochstetteri</i> v. <i>glabrior</i>	442	<i>Phyllachora</i>	421, 422
<i>howardiana</i>	441	<i>Phyllachora Aberiae</i>	452
<i>infectoria</i>	441	<i>Acaciae</i>	444
<i>ingens</i>	443	<i>Albizziae</i>	457
<i>natalensis</i>	442	<i>amaniensis</i>	440
<i>Pretoriae</i>	443	<i>anthistiriicola</i>	427
<i>religiosa</i>	443	<i>Arundinellae</i>	427
<i>sycomorus</i>	441	<i>Baumii</i>	455
<i>trachyphyllus</i>	443	<i>Bottomleyae</i>	425
<i>Flacourtiaceae</i>	452	<i>Brachypodii</i>	431
<i>Gramineae</i>	423	<i>Brachystegiae</i>	445
<i>Grewia occidentalis</i>	450	<i>Burgessiae</i>	450
<i>Helichrysum</i>	461	<i>caffra</i>	456
<i>Hibiscus</i>	450	<i>capensis</i>	452
<i>Hibiscus tiliaceus</i>	450	<i>chloridicola</i>	430
<i>Homostegia Albizziae</i>	457	<i>Chrysopogonis</i>	423
<i>Hyparrhenia cymbaria</i>	424	<i>circinata</i>	448
<i>hirta</i>	424	<i>crotonicola</i>	448
<i>Ischaemum aruatum</i>	425	<i>Crotonis</i>	448
<i>Isothea rhytismoides</i>	443	<i>Cynodontis</i>	429
<i>Kniphofia aloides</i>	461	<i>Cynodontis</i> v. <i>chloridis</i>	430
<i>Lebeckia Candolleana</i>	460	<i>dalbergiicola</i>	446
<i>Leguminosae</i>	444	<i>Digitariae</i>	433
<i>Leptocarydion Vulpiastrum</i>	430	<i>digitaricola</i>	433
<i>Lessertia depressa</i>	460	<i>Doidgeae</i>	423, 460
<i>perennans</i>	460	<i>Dombeayae</i>	451
<i>stricta</i>	460	<i>Elyonuri</i>	424
<i>tenuifolia</i>	460	<i>Eragrostidis</i>	430
<i>Loudetia simplex</i>	428	<i>Evansii</i>	436
<i>Malvaceae</i>	450	<i>ficum</i>	441
<i>Melanthaceae</i>	449	<i>gentilis</i>	454
<i>Melanthus major</i>	449, 450	<i>goyazensis</i>	453
<i>Melinis minutiflora</i> v. <i>mutica</i>	434	<i>graminis</i>	421
<i>tenuinervis</i>	434	<i>grammica</i>	441, 443
<i>Microdiplodia rikatiensis</i>	445	<i>Grewiae</i>	450
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THE GENUS *ERIOMYCOPSIS* SPEC.

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The present paper is the outcome of a long study of the hyper-parasites of the leaf fungi of Uganda, extended recently to collections received from F. L. Hendrickx, Congo Belge; Dr. Bitancourt, Sao Paulo, Brazil; and from Dr. E. M. Doidge, Pretoria. Members of the present genus are some of the most common hyper-parasites of *Meliola*, *Asterina* and other leaf fungi, and appear to occur throughout the range of their hosts. One of the greatest difficulties in dealing with these hyper-parasites is to obtain material sufficiently uniform for preservation as herbarium specimens, and the experience of the writer has led him to take as the unit specimen the actual single colony of the host fungus examined, and even here there may be more than one species of *Eriomycopsis* occurring in mixed infection. On a single leaf a number of colonies of *Meliola* or *Asterina* or both may be found, and these may show a wide range of hyper-parasites, not only of this present genus but of others totally unrelated. In view of this difficulty a series of microscopical preparations have been made by the writer and deposited in the Herbarium of the Imperial Mycological Institute, Kew, to serve as examples of the various species described below.

The genus *Eriomycopsis* was founded by Spegazzini in 1910 (An. Mus. Nac. Buenos Aires, xx, p. 429) on the species *E. Bomplandi*, parasitic on *Meliola*. Sydow in Ann. Myc., xxvii, p. 137 (1929) described a second species *E. tenuis*, parasitic on *Parodiopsis Stevensii*, differing considerably from *E. Bomplandi*. These two species are all the writer has been able to trace as published hitherto, but in the collections examined by him a series of forms have been found, obviously related to the two species mentioned above, but exhibiting a considerable range in structure and conidial formation. These are described below, and in order to include them in *Eriomycopsis*, the original generic diagnosis must be modified. The conidia are in most species formed on short sterigmata, either hollow or apparently solid, at first terminal on the conidiophore, but becoming lateral by the growth of the latter past the sterigma; in *E. Sclerochitonis* the conidiophore grows through the conidial scar so that this remains as a broken ring around the wall of the conidiophore. In some species the sterigmata are not evident and the conidia leave merely a flat scar on the conidiophore, while in others the sterigma adheres to the conidium when this matures and falls off, instead of to the wall of the conidiophore. In a few species the mycelium and sometimes the conidiophores become distinctly smoky in colour.

ERIOMYCOPSIS Speg., emend.

Hyphomycetea mucedinea, macronemea, in fungis aliis hyperparasitica; conidiophora erecta simplicia continua vel septata; conidia in sterigmatibus minutis producta, angula, acro-pleurogenae fusoides vel filiformia, 1-multi-septata, hyalina, majuscula levia.

KEY TO SPECIES.

- Conidia more or less filiform.
 - Conidia hamate, 1-septate, $-30 \times 2.5 \mu$ *hamata* (1).
 - Conidia not hamate.
 - Conidiophores hardly differentiated, conidia 0-3-septate, $-35 \times 3 \mu$ *minima* (2).
 - Conidiophores apparent, elongate, erect.
 - Conidia 3-sept., $-70 \times 3.5 \mu$ with long attenuate apex; colour developed in old colonies..... *flagellata* (3).
 - Conidia 3-5-sept., $70-100 \times 2.5-3.5 \mu$, always hyaline..... *angustispora* (4).
- Conidia narrow (-7μ) but not filiform.
 - Sterigmata rudimentary or none.
 - Conidial scars lateral.
 - Conidia 2-5-sept., $-70 \times 5 \mu$ *africana* (5).
 - Conidia 5-10-sept., $-60 \times 6 \mu$ *Asterinae* (6).
 - Mycelium and conidiophores yellowish, conidia 3-sept., with apical beak, $-45 \times 5-7 \mu$ *Bosquiaeae* (7).
 - Conidial scars broken rings on c'phore, conidia 3-7-sept., slightly hamate, $-90 \times 5-7 \mu$ *Sclerochitonis* (8).

- Sterigmata lateral on conidiophore.**
Conidia clavate, rounded at apex, 3-sept., 20-37 × 5-8 μ..... *Schiffnerulae* (9).
Conidia fusoid, with basal sterigma.
Mycelium becoming smoky, conidia 3-sept., -50 × 7 μ..... *Ugandae* (10).
Mycelium remaining hyaline.
Conidia 3-sept., acute at apex, 16-45 × 5.5-8 μ..... *tenuis* (11).
Conidia 3-sept., apex long attenuate, 30-70 × 5-6 μ..... *Trichiliae* (12).
Conidia more than 7 μ wide.
Sterigmata present.
Conidia fusoid, 3-5-sept., 45-90 × 7-10 μ..... *Bomplandi* (13).
Conidia with attenuate apex, sterigmata reduced to flat scars 3 × 1 μ,
conidia 3-7-sept., 50-100 × 6-9 μ..... *robusta* (14).
Sterigmata absent.
Conidia 3-6-sept., 50-80 × 7-9 μ, apex attenuate-rounded..... *Chorleyi* (15).
Conidia 4-sept., 70-80 × 11-12 μ, apex flagellate, base conoid-truncate... *Meliolae* (16).

1. *E. hamata* Hansf., sp. n.

Plagulae albae tenues vel densae. Mycelium ex hyphis hyalinis agglutinis 2-3 μ crassis indistincte septatis ramosissimis compositum. Conidiophora erecta 0-1-septata simplicia hyalina sursum attenuata et geniculata, usque ad 50 μ longa. Sterigmata minuta solida. Conidia hamata hyalina 1-septata haud constricta, versus basim truncatulum attenuata, apice flagellata curvata, 25-30 × 2-2.5 μ.

Hab. in plagulis *Meliolae* spec., Rifle Range, Kiagwe, *Hansford* 2676 p.p.

The fungus forms white colonies varying much in density and completely covering the colony of the host. The conidiophores arise as lateral branches from the mycelial hyphae and at the basal septum they bend through a right angle to become vertical. Conidia similar to those of this species are occasionally found in colonies of other species of this genus, and further investigation is needed to determine whether in such cases *E. hamata* occurs in mixed infection, or whether other species in young stages form conidia of this type. *E. hamata* is often associated with a common Discomycete parasite of *Meliola* and may be its conidial stage.

2. *E. minima* Hansf., sp. n.

Plagulae albae vel dilute roseae tenues; mycelium ex hyphis repentibus hyalinis reticulatis indistincte septatis 3 μ crassis compositum. Conidiophora erecta 30-50 μ longa simplicia hyalina 0-3-septata recta vel geniculata, circa 4 μ crassa. Conidia singula fusioidea hyalina utrinque acuta 0-3-septata haud constricta 20-35 × 2-3 μ.

Hab. in plagulis *Ireninae glabrae*, Kampala, Uganda, *Hansford* 1871 p.p.

Other Uganda collections (*Hansford*) are 2859, on *Balladyna tenue*, 2861 on *Balladyna magnifica*, 2869 on *Meliola Rhois*, 2984 on *Irenopsis Macarangae*. In S. Africa the following have been determined as this species (the collection numbers are those of Herb. Myc., Pretoria): 1402 on *Meliola capensis*, 11020 on *M. comata*, 32229 on *Meliola ganglifera*, 1781 on *Irene Strophanthi*, 17166 on *I. Podocarpi*, 17107 on *I. Nuriae*.

In this species the conidiophores are usually mere erect ends or short branches of the mycelial hyphae, with a few scattered minute granules or warts, less than 1 μ high, on the surface of the end cell, possibly representing rudimentary sterigmata. The conidia are slightly bent, acute at both ends, with little distinction between base and apex, very indistinctly 3-septate or merely guttulate.

3. *E. flagellata* Hansf., sp. n.

Plagulae tenues albidae vel sordidae; mycelium ex hyphis hyalinis vel dilute fuliginis repentis septatis ramosissimis subagglutinis 2-4 μ crassis compositum. Conidiophora singula vel fasciculata erecta simplicia vel rarius furcata hyalina vel inferne dilutissime fuliginea, usque ad 200 μ longa, 3-5-4-5 μ cr., pluriseptata, superne geniculata et sterigmati praedita; sterigmata 1 μ longa. Conidia singula terminalia filiformia hyalina utrinque attenuata, basi truncatula, apice curvula flagellata, 3-septata, 40-70 × 2-3.5 μ.

Hab. in plagulis *Ireninae* spec., Gayaza Road, Uganda, *Hansford* 2635.

Other collections of this species are: (Uganda, *Hansford*) 2571, 2684 on *Irenina* and *Asterina* on *Trema*, 2710 on *Irenina Hansfordii*, 2843 on *Meliola borneensis*, 2881 on *Meliola Artabrorthydis*, 2696 on *Schiffnerula mirabilis*; Arruda 2981 on *Irenopsis tortuosa*, Brazil.

In old colonies the mycelium and base of the conidiophores turn smoky brown; the conidia are terminal, each leaving a minute solid sterigma about 1 μ long on the conidiophore; the latter continues its growth so that the old sterigmata become lateral and the axis is more or less geniculate at each. The conidia are narrow filiform with a bent whip-like apex, attenuate and truncate at the basal hilum.

4. *E. angustispora* Hansf., sp. n.

Plagulae tenues albidae; mycelium ex hyphis hyalinis repentis indistincte septatis ramosissimis $2\ \mu$ cr. compositum. Conidiophora lateralia erecta continua simplicia hyalina usque ad $40\ \mu$ longa, $3-4\ \mu$ cr., superne leniter attenuata; sterigmata nulla. Conidia terminalia filiformia curvula 3-5-septata hyalina haud constricta basi truncata apice attenuato-rotundata, $70-100 \times 2.5-3.5\ \mu$.

Hab. in plagulis *Hysterostomellae Tetracerae*, Entebbe Road, Uganda, *Hansford* 2796. This differs from *E. flagellata* in its short hyaline conidiophores; in the type specimen it is associated with a species of *Calonectria*.

5. *E. africana* Hansf., sp. n.

Plagulae tenuissimes albidae; mycelium ex hyphis hyalinis agglutineo-reticulatis $1.5-2\ \mu$ crassis compositum. Conidiophora erecta simplicia hyalina usque ad $55\ \mu$ longa, basi $3.5-4\ \mu$ cr., 0-1-septata superne leniter geniculata. Sterigmata nulla. Conidia terminalia singula elongato-fusioidea curvula utrinque attenuata basi truncata, apice acuta, 2-5-septata haud constricta $40-70 \times 3.5-5.5\ \mu$.

Hab. in plagulis *Asterinae* in foliis *Justiciae* spec., Hoima Road, Uganda, *Hansford* 2671.

The colonies are very thin and hardly visible, white. The conidiophores are erect branches of the mycelial hyphae, each arising from a swollen "foot cell" and are slightly attenuate upwards, usually 1-septate just above the base. The conidia are formed singly at the end of the conidiophore and leave no sterigma but merely a flat scar at which there is slight geniculation of the conidiophore after its elongation. Very young conidia somewhat resemble those of *E. hamata*.

6. *E. Asterinae* Hansf., sp. n.

Plagulae effusae tenues albidae; mycelium ex hyphis hyalinis $3\ \mu$ cr. ramosissimis subagglutinis compositum. Conidiophora numerosa erecta simplicia usque ad $80\ \mu$ longa, $3-4\ \mu$ cr., 0-2-septata superne geniculata. Conidia singula terminalia elongato-fusioidea hyalina utrinque rotundata basi truncata apice subacuta vel rotundata 5-10-septata haud constricta $30-60 \times 4-6\ \mu$.

Hab. in plagulis *Asterinae diplocarpae*, Entebbe Road, Uganda, *Hansford* 2514.

Other collections: Uganda, *Hansford*: 2778, 2790 on *Asterina*, 2905 on *Asterinella* sp. on *Loranthus*, 2967 on *Asterina*; S. Africa, *Doidge* 17176 on *Asterina*.

The colonies are very thin and somewhat powdery, white, extending beyond those of the host. The conidia leave no sterigmata on the conidiophore, which is slightly geniculate at the flat scars. The base of the conidium is often slightly apiculate, ending in a truncate hilum and the septation is higher than in other species, with much shorter cells.

7. *E. Bosquieae* Hansf., sp. n.

Plagulae velutinae flavidae; mycelium ex hyphis flavidis vel flavo-brunneis septatis $4\ \mu$ cr. ramosis reticulatis compositum. Conidiophora fasciculata erecta simplicia vel irregulariter furcata, deorsum flavida, sursum hyalina, usque ad $140\ \mu$ longa, $4\ \mu$ cr.; sterigmata nulla. Conidia terminalia singula, primo obovata demum obclavata apice attenuato-hamata hyalina vel dilutissime flavida 3-septata usque ad $45\ \mu$ longa, $5-7\ \mu$ cr., apice $1-2\ \mu$ cr., basi attenuato-truncata.

Hab. in *Meliola Soroceae* in foliis *Bosquieae Phoberos*, Entebbe Road, Uganda, *Hansford* 2913.

This differs from other species in its pronounced yellow colour; the conidia are very like those of *Arthrosporium parasiticum* Wint., but in the present collections there is no sign of a Stilbaceous aggregation of the conidiophores. The fungus has been collected repeatedly in Uganda, always on the same host.

8. *E. Sclerochitonis* Hansf., sp. n.

Plagulae tenues albidae; mycelium ex hyphis hyalinis septatis ramosissimis subagglutinis repentis compositum. Conidiophora sparsa vel laxe aggregata erecta simplicia vel apice furcata hyalina septata circa $100\ \mu$ longa et $4-6\ \mu$ cr., basi sub-bulbosa ($-9\ \mu$) superne leniter attenuata ($3-4\ \mu$). Conidia singula terminalia hyalina curvula fusioidea, plerumque 5-septata haud constricta apice attenuato-acuta curvulaque, basi subtruncata, $50-90 \times 5.5-7\ \mu$.

Hab. in plagulis *Meliolae Sclerochitonis*, Masaka Road, Uganda, *Hansford* 2003 p.p.

Other collections: Uganda, *Hansford*: 2968 on *Meliola*, 1199a on *Meliola*.

The method of conidial formation distinguishes this species from all others; each conidium leaves a flat, slightly hollow scar, though which the conidiophore continues its apical growth. The conidia are somewhat attenuate-beaked and bent at the apex; they germinate by extension of the apex into a hypha and by a thin hypha produced through the truncate base.

9. *E. Schiffnerulae* Hansf., sp. n.

Plagulae albae effusae plus minusve velutinae; mycelium ex hyphis hyalinis 2-3.5 μ cr. ramosissimis subagglutinis septatis compositum. Conidiophora aggregata vel dispersa usque ad 300 μ longa 3-4.5 μ cr. septata plerumque simplicia superne geniculata sterigmatibus praedita. Conidia clavata basi attenuata apice late rotundata, recta 3-septata haud constricta 20-37 \times 5-8 μ .

Hab. in plagulis *Schiffnerulae mirabilis* in foliis *Passiflorae*, Entebbe Road, Uganda, *Hansford* 1819.

Other collections: Uganda, *Hansford*: 1846, 1841, 1821, 2641, 2825, on *Schiffnerula* spp.; 2325, 2342 on *Balladyna* spp.; 2664 on *Meliola*.

This differs from *E. tenuis* in the rounded apices of the conidia; the sterigmata are widely separated along the conidiophore and are up to 4 μ long by 1 μ wide, hollow cylindric with a septum at the base; by continued growth of the conidiophore they are left as lateral spines.

10. *E. Ugandae* Hansf. sp. n.

Plagulae albae vel sordidae tenues; mycelium ex hyphis hyalinis vel dilute fuliginis ramosis reticulatis septatis 3-4.5 μ cr. compositum. Conidiophora dispersa vel laxa aggregata erecta simplicia hyalina vel inferne dilute fuliginea, usque ad 300 μ longa, 4-6 μ crassa, simplicia, superne geniculata. Conidia singula terminalia hyalina fusioidea utrinque attenuata apice subacuta, basi truncato-apiculata, 3-septata haud constricta 30-50 \times 5-7 μ . Sterigmata numerosa cylindracea usque ad 5 μ longa et 1-1.5 μ cr.

Hab. in plagulis *Schiffnerulae Brideliae* in foliis *Brideliae*, Kampala, Uganda, *Hansford* 1331 p.p.

Other collections Uganda, *Hansford*: 2678, 2641, 2634, 2959 on *Schiffnerula* spp.; S. Africa, *Doidge* 12298 on *Irene scabra*.

The sterigmata in *M. Ugandae* are rather larger and more numerous than in *E. Schiffnerulae*, from which it differs in shape and size of conidia and in the production of colour in older colonies. The sterigmata are hollow cylindric with a basal septum.

11. *E. tenuis* Syd. in Ann. Myc., xxvii, p. 137 (1929).

Colonies white, loose to dense, or thin arachnoid, often subfloccose, effuse. Mycelium of loose branched hyphae, creeping, hyaline, remotely and indistinctly septate, 4-6 μ wide. Conidiophores erect, straight or slightly curved, rarely undulate, 4-5 μ wide, remotely and indistinctly septate, 100-170 μ long, hyaline, with 3-6 minute papillae towards the tip. Conidia solitary on papillae, oblong-clavate to almost oblong-fusoid, rarely oblong ellipsoid, widest in upper part, rounded to acute at the apex, when mature 3-septate, 25-45 \times 5.5-8 μ .

On *Parodiopsis Stevensii* on *Inga marginata*, Porto Rico, Sydow, Fung. exot. exs., No. 704.

Sydow's original description gives the conidia as wide rounded at the apex, but examination of this specimen shows by far the greater number of conidia to have definitely acute apices, and it is considered that those with rounded apices are immature. No other collection of this fungus has been found by the present writer.

12. *E. Trichiliae* Hansf., sp. n.

Plagulae albae tenues; mycelium ex hyphis hyalinis repentis septatis ramosissimis reticulatis subagglutinatis 2.5-3.5 μ cr. compositum. Conidiophora erecta subrecta hyalina septata simplicia 40-150 \times 3-6 μ , sursum leniter attenuata; sterigmata 1-2 μ longa. Conidia singula terminalia hyalina fusioidea, apice attenuata vel caudata, basi attenuato-apiculata, recta vel curvula, 3-septata 30-70 \times 4.5-6 μ .

Hab. in plagulis *Asterinae* spec., foliis *Trichiliae*, Entebbe Road, Uganda, *Hansford* 2517.

Also *Hansford* 2833, 2829 on Microthyriaceae on *Teclea*, Kiterera, Busoga, Uganda.

The conidia differ from *E. Schiffnerulae* and *E. tenuis* in the attenuate to beaked apex; at the base they retain the greater part of the cylindric, straight or bent, solid sterigma.

13. *E. Bomplandi* Speg. in Myc. Argent., v, No. 429 in Anal. Mus. Nac. Buenos Aires, xx (1910).

Spegazzini's original description gives: Colonies white, velvety, on *Meliola*. Conidiophores erect 5-6-septate, $180-200 \times 7-8 \mu$, top cell colliculose-papillate and bearing conidia, $40-50 \times 9-10 \mu$. Conidia borne on sterigmata on terminal cell of conidiophore, $50-70 \times 10-11 \mu$, usually 3-septate, ends acute, slightly arcuate, not or slightly constricted.

In Herb. Kew there is no specimen of *E. Bomplandi*, but *Balansa 4744* and *Roum 4141*. (leg. *Balansa*), sub. *Calonectria melioloides* Speg. both show an *Eriomycopsis* corresponding rather closely to the above description, as well as a species of *Calonectria* with setose perithecia and therefore not *C. melioloides* Speg., which is described as glabrous. In these specimens the *Eriomycopsis* has the following characters:—

Conidiophores erect from an agglutinate plate of hyaline hyphae, fasciculate or scattered, $200-400 \times 6-7 \mu$, swollen at the base to $8-10 \mu$ wide, hyaline, rather thick-walled, with 5-10 cross septa, simple. The uppermost cell, rarely also the next below, has numerous hollow cylindric sterigmata 3μ wide and 2μ long, on the surface. The conidia are fusoid slightly bent, attenuate at the ends, slightly narrower at the rounded apex than at the subtruncate base, mostly 3-septate but sometimes with a more or less indistinct fourth septum towards the apex, smooth, thin-walled, hyaline, not usually constricted, $45-70 \times 7-10 \mu$.

Hansford 2684 on *Irenina Tremue* has conidia rather narrower and more bent at the apex than these Brazilian specimens, but is considered to be *E. Bomplandi*. *Deighton CB 825* on *Meliola* on *Milletia*, Gold Coast, has conidia $50-90 \times 8-10 \mu$, mostly 4-septate; the sterigmata are rather longer and narrower than in typical *E. Bomplandi*, though here it is included in this species. Other collections examined by the writer and included here are: Uganda, *Hansford*: *2490* on *Irene* on *Oncoba*, with the perithecial stage (*Calonectria Ugandae* Hansf.), *2640* on *Meliola Maitlandii*, *2791* on *Asterina Tremue*, *2835* on *Meliola Albizzia* (with *C. Ugandae*); Congo Belge, *Hendrickx*: *858* on *Irenopsis Caloncoba* (with *C. Ugandae*), *1062* on *Meliola bicornis* var.; S. Africa, *Doidge*: *17772* on *Irene natalensis* [with unripe *C. Ugandae* (?)], *11611* on *Irene scabra*, *11338* on *I. scabra* (with *C. Ugandae*), *12298* on *I. scabra* (do.), *17181* on *I. Nuriae*, *32234* on *I. atra*, *22410* on *Meliola* on *Olea*, *32122* on *Meliola Goniomae*, *32229* p.p. on *M. ganglifera*, *10933* on *M. ganglifera*.

14. *E. robusta* Hansf., sp. n.

Plagulae albae tenues; mycelium ex hyphis hyalinis subagglutinis septatis 3μ cr. compositum. Conidiophora erecta dispersa vel fasciculata hyalina septata simplicia rarius furcata rigida superne geniculata, $150-300 \times 7-9 \mu$. Conidia singula terminalia fusoida hyalina utrinque attenuata, basi truncata, apice longe attenuata, 3-7-septata haud constricta $50-100 \times 6-8 \mu$.

Hab. in plagulis *Meliolae*, *Hansford 2667*, Hoima Road, Uganda.

The conidiophores are very rigid and thick-walled: sterigmata short and wide ($1 \times 3-4 \mu$) on the upper two cells of the conidiophore as raised thickened portions of the wall. The conidia have rather a wide truncate base ($3-4 \mu$) and the apex is drawn out into a narrow curved beak: septation averages higher than in *E. Bomplandi*.

15. *E. Chorleyi* Hansf., sp. n.

Plagulae albae tenues: mycelium ex hyphis hyalinis reticulatis ramosissimis remote septatis 3μ cr. compositum. Conidiophora erecta solitaria vel fasciculata septata hyalina simplicia superne nodulosa $100-180 \times 5-6 \mu$. Conidia terminalia singula fusoido-falcata hyalina 3-6-septata haud constricta, apice attenuata rotundata, basi truncata, $50-80 \times 7-9 \mu$.

Hab. in plagulis *Meliolae Chorleyi* in foliis *Trichillae*, Entebbi Road, *Hansford 2357*, *2585*.

No sterigmata are present in this species and the conidia leave a flat scar on the conidia which is rarely geniculate.

16. *E. Meliolae* Hansf., sp. n.

Mycelium tenue album, ex hyphis reticulatis $4-6 \mu$ cr. septatis remosissimis compositum. Conidiophora fasciculata (-20) erecta hyalina recta vel subrecta simplicia septata $280-400 \times 6-9 \mu$, superne nodulosa. Conidia acrogea singula hyalina fusoida curvula 3-4-septata leniter constricta, basi conoideo-truncata, apice attenuata in appendicem filiformam producta ($40 \times 1.5-2 \mu$), conidia tota $65-90 \times 11-12 \mu$.

Hab. in plagulis *Meliolae Tecleae* in foliis *Tecleae*, Kazi, Kampala, Hansford 1909 p.p.

Other collections (Uganda, Hansford): 2834 on *M. Tecleae*, 2866 on *M. Tecleae*, 1539, 2608, 2874 on *Meliola* spp. on *Rhus glaucescens*. In all these specimens, as in the type, the fungus is accompanied by the perithecial stage, *Calonectria Meliolae* Hansf.

No sterigmata occur, the conidia leaving only a flattened scar on the conidiophore at which the latter is geniculate-nodulose.

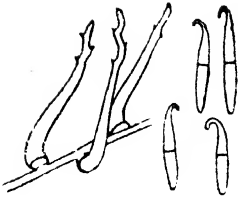
Apart from the perithecial stages assigned above to certain species of *Eriomycopsis*, other cases of association have been recorded but are not yet sufficiently definite. Attempts have been made to cultivate *Eriomycopsis* on artificial media but have not been successful, while from many perithecial forms associated with *Eriomycopsis* only *Cephalosporium* conidia have been produced in culture.

The writer is indebted to Mr. E. W. Mason of the Imperial Mycological Institute for pointing out the difference between *E. tenuis* and its near relatives.

FIGURES. All $\times 1,000$.

In each illustration the conidiophores or their ends are given on the left, the conidia on the right.

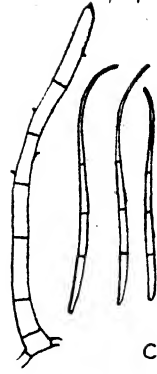
- | | |
|-------------------------------|---|
| A. <i>E. hamata</i> . | K. <i>E. Trichiliae</i> . |
| B. <i>E. minima</i> . | L. <i>E. Bomplandi</i> . |
| C. <i>E. flagellata</i> . | M. <i>E. Bomplandi</i> (ex Deighton CB 825). |
| D. <i>E. africana</i> . | N. <i>E. robusta</i> . |
| E. <i>E. Asterinae</i> . | O. <i>E. Chorleyi</i> . |
| F. Omitted. | P. <i>E. Meliolae</i> . |
| G. <i>E. Sclerochitonis</i> . | Q. <i>E. angustispora</i> . |
| H. <i>E. Schiffnerulae</i> . | R. <i>E. tenuis</i> . |
| J. <i>E. Ugandae</i> . | S. <i>E. Trichiliae</i> , showing variation from K. |



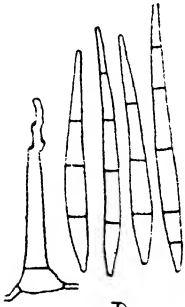
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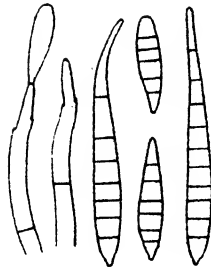
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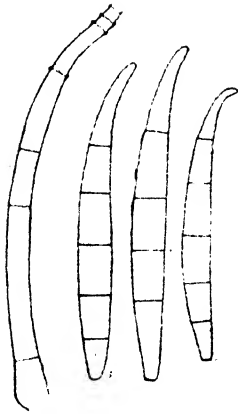
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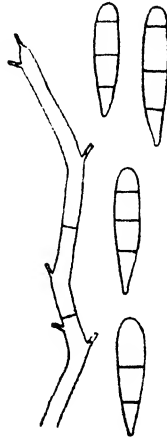
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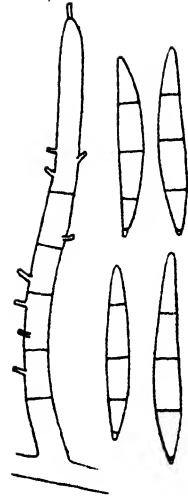
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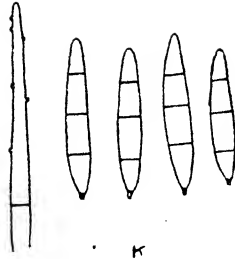
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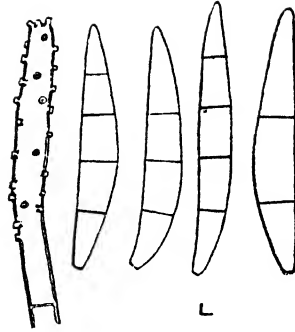
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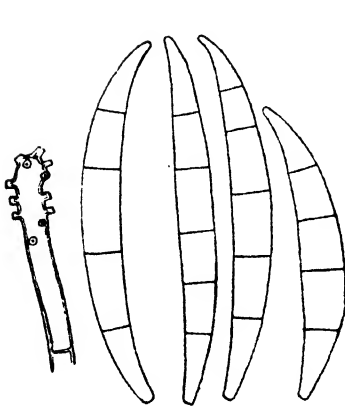
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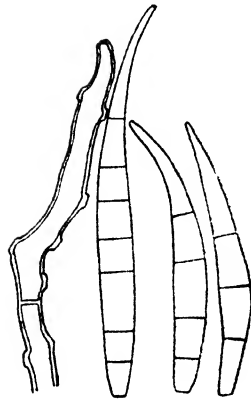
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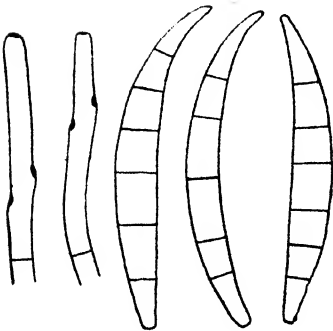
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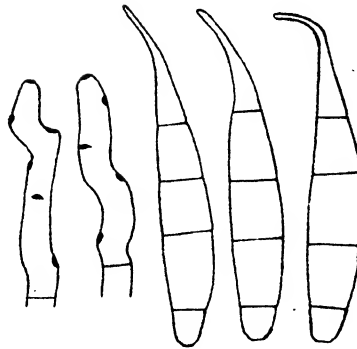
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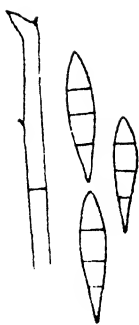
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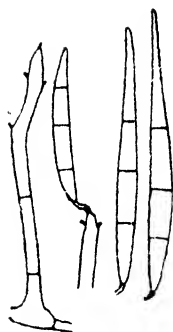
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- p. 481 on should be in Order 10. Family 1.
- p. 482 insert line 6.1 being "C. pilatum" match middle line above
- bring forward line concerning "Plantae num. rods" to match line above concerning "Plantae num. by inter"
- p. 566 l. copraliform should be copraliform reg.
- p. 579 better add "1850-1851".
- p. 623 type.
- p. 627 insert 1 before 1-623
- p. 656 X3 should be 3
- p. 732 leucophila should be leucophila
- p. 748 "unxybanded" should be "unxybanded"
- p. 750 "Figured" should be "Figured".

Vol. IV.

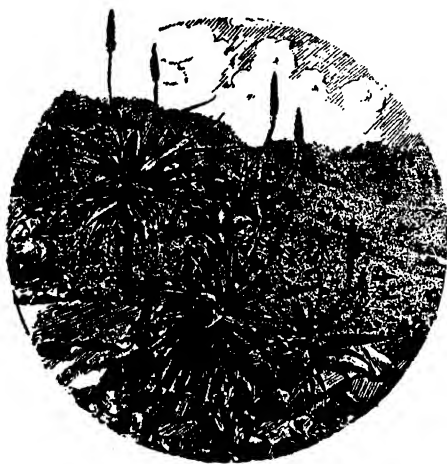
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A RECORD OF
CONTRIBUTIONS
FROM THE
NATIONAL HERBARIUM
UNION OF SOUTH AFRICA
PRETORIA



EDITED BY

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GASTEROMYCETES OF SOUTH AFRICA.

By A. M. BOTTOMLEY.

The following account of the Gasteromycetes in South Africa is the outcome of an early interest in the Geasters. Available literature on the subject was at that time scanty and not easily accessible to the average person interested in these quaint plants, which formerly occurred very commonly in and around Pretoria. The original intention was simply to publish a more or less popular note on these fungi for such people, but as time went on and more data were spasmodically accumulated on these and related plants, it was finally decided to write up an account of all the Gasteromycetes even if imperfectly known. This decision was influenced by the fact that no comprehensive work on this group had been written since 1925, when Verwoerd published his "Suid-Afrikaanse Lycoperdaceae en Nidulariaceae" in Volume III of the *Annale van die Uniwersiteit van Stellenbosch*. The present publication is not in any sense a critical revision of the Gasteromycetes; it is merely an assembling of all the known records of these fungi in Southern Africa. The author is fully aware of its many defects, but it is hoped that it will form a basis for more critical work by those coming after and will fill a long felt want for something fuller, and more comprehensive than papers previously published in this country.

The Gasteromycetes, probably on account of their size and often strange appearance, attracted the attention of many of the early travellers and botanists, who frequently included specimens of these fungi—more as curiosities than anything else—in general botanical collections, which they sent to European herbaria for identification. Unfortunately, however, such collections often consisted of a single specimen, or, on account of their fragile nature, arrived in a damaged condition. As a result it is sometimes difficult to link up later collections with the old specimens, especially as descriptions in the early days were usually inadequate and illustrations, if any, sometimes rather crude and diagrammatic. These early collectors were extremely lucky in their discoveries, including as they did, some of our most uncommon and interesting fungi. One of the first Gasteromycetes recorded for South Africa was the plant now called *Podaxis pistillaris* (L. ex Pers.) Morse—long known as *Podaxon carcinomalis* (L.) fr.—collected by Thunberg on antheaps and originally described by Linnaeus in 1781 as *Lycoperdon carcinomalis*. The next discovery of note was that of *Secotium Gueinzii* Kze. found by Gueinzus in sandy soil in the Cape Peninsula and a few months later by Zeyher at Uitenhage. This fungus has not since been found in the latter locality and only infrequently in the original site and is not known from anywhere else. In 1843 Burke and Zeyher discovered *Polyplocium inquinans* Berk. on the banks of the Orange River; it was not rediscovered for eighty years when Pole Evans found it in 1919 growing out of an antheap at Vryburg. A year after this find, Backhouse came across *Broomeia congregata* Berk., which, as far as is known, is endemic in South Africa. Nothing uncommon was collected during the next twenty years but with the arrival of MacOwan at the Cape in 1861 and Medley Wood in Natal, many new species of fungi, including numerous Gasteromycetes, were collected. MacOwan's most important finds in this field were probably *Kalchbrennera corallocephala* (Welw. and Curr.) Kalchbr. and *MacOwanites agaricinus* Kalchbr., both rare fungi, the latter not having been found since the original collection. Among Medley Wood's more interesting collections were some of the phalloids such as *Lysurus Gardneri* Berk., originally described by MacOwan as *L. Woodii*, *Kalchbrennera corallocephala* and *Dictyophora indusiata*. Neither MacOwan nor Medley Wood was a mycologist and the custom of their predecessors of sending specimens overseas for identification was continued, with this difference, that duplicate specimens were retained in the country and these formed the nucleus of the first mycological herbaria in South Africa. In the work of identification they received the ready co-operation of such well-known mycologists as Berkeley, Kalchbrenner, Cooke, Montagne, van Thumen and Winter. It was not until the appointment of Dr. I. B. Pole Evans, in 1905, as Mycologist to the

Transvaal, that any mycological work was done in the country, or that a serious attempt was made to build up a fungus herbarium. In addition to the mycological staff attached to the Department of Agriculture, collectors of Gasteromycetes include in particular :— Dr. A. V. Duthie, who collected extensively round Knysna and Stellenbosch ; Miss E. L. Stephens, who confined her activities to the rich fields of the Western Cape Province ; Professor N. J. G. Smith, who is particularly interested in the Geasters of the Eastern Cape areas ; and Mr. J. P. H. Acocks and Mr. Gideon Joubert, who have enriched our collections with a number of rare species.

The Gasteromycetes in the Cryptogamic Herbarium of the Division of Botany and Plant Pathology, Department of Agriculture, Pretoria, form the basis of the present work, but as many specimens as possible from other South African herbaria have been examined. In this connection visits have been paid to the South African Museum in Cape Town, where many of MacOwan's specimens are deposited ; to the Cape Town University, where Miss E. L. Stephens has built up an excellent mycological museum ; and to the Stellenbosch University, where the van der Byl collections are housed. The Southern Rhodesia Department of Agriculture very kindly sent me their Gasteromycete collection on loan. Owing largely to difficulties caused by the war it has not been possible to examine specimens in overseas herbaria.

In the particulars given for individual specimens, the name and number of the collector are printed in italics ; duplicate specimens are placed in brackets, accompanied by an abbreviation of the name of the herbarium in which they are to be found, while the Pretoria numbers are unbracketed. Dates of collections have been recorded to assist collectors in knowing when specific fungi may be expected to appear, since, especially in the case of plants with a short fruiting season, they occur at different times in different parts of the country depending, for the most part, on the rainfall. The appearance of many of the Gasteromycetes in South Africa is very sporadic, some occurring only in exceptionally wet seasons. The following abbreviations have been used to indicate the herbaria in which duplicate and other specimens may be found :—

Alb. Mus.....	Albany Museum, Grahamstown.
E.L.S.....	E. L. Stephens, Cape Town University.
Lloyd Myc. Coll.	Lloyd Mycological Collections, Washington, U.S.A.
N.H.....	Natal Herbarium, Durban.
N.J.G.Sm.....	N. J. G. Smith, Albany Museum, Grahamstown.
S.R.....	Southern Rhodesia, Department of Agriculture, Salisbury.
S.A.M.....	South African Museum, Cape Town.
Stell.....	Stellenbosch University Herbarium, Stellenbosch.
T.R.L.....	Timber Research Laboratory, Chamber of Mines, Johannesburg.
v.d. Byl.....	van der Bijl Herbarium, University of Stellenbosch.
Wit. Herb.....	Witwatersrand University Herbarium, Johannesburg.

As far as possible descriptions have been made from actual specimens, but where such were unsuitable or lacking, these have been augmented or taken over from well known publications such as "Gasteromycetes of Australia and New Zealand" by G. H. Cunningham, "The Gasteromycetes of the United States and Canada" by Coker and Couch, "Gasteromycetes Ungariae" by Hollós and "British Basidiomycetes" by Carleton Rea. Lloyd's Mycological Writings have been consulted mainly for their excellent photographs while Verwoerd's "Suid-Afrikaanse Lycoperdaceae en Nidulariaceae" has been referred to especially for descriptions of new South African species.

Literature references have for convenience been given throughout the text. In addition to the full reference to the original description, references in accepted abbreviated form have been given to the more recent works in which the fungi concerned have been discussed or more fully described and which are more likely to be available for consultation than the older publications.

Colours in the Gasteromycetes are often difficult to match in colour charts but where this has been done, those of Ridgway have been used, such names being prefaced by capital letters and usually put in brackets.

Lacto-phenol has been used as a mountant for microscopic examinations. Spores have, in addition, been examined dry in which condition surface markings are often more clearly defined.

The system of classification followed is that of G. H. Cunningham as outlined in his "Gasteromycetes of Australia and New Zealand", published in 1944. This is the most recent comprehensive account of these fungi, being the result of many years of critical study of the group in all its aspects, developmental as well as morphological. Not only have the principles of his general classification been adopted, but many of his keys to the genera and species have been used, especially in cases where the fungi under discussion are poorly represented in South Africa and consequently imperfectly known.

I would like to express my gratitude to the following for assistance given in the preparation of this paper :—In particular to Dr. E. M. Doidge for many helpful suggestions, for records of early collections and for practical help, without which it would have been difficult, under present conditions, to get the paper ready for publication—to Miss E. L. Stephens for placing her collections at my disposal and for her untiring energy in obtaining Cape specimens and relative data—to Mr. H. A. V. King for his excellent photographic work often rendered difficult by lack of suitable material due to wartime shortages—to Miss E. M. Wakefield for suggestions and identifications of specimens, and to Mr. P. D. B. Talbot for the comparison of specimens in Kew herbarium. Thanks are also due to Dr. Barnard, Director of the South African Museum and to Miss G. J. Lewis for their courtesy in giving me access to the herbarium at that institution, and to Dr. Nel, Professor of Botany at Stellenbosch University and his assistant Miss P. de Vos for the same courtesy in connection with the van der Byl collections—to the Southern Rhodesia Department of Agriculture for the loan of its Gasteromycete collections—to Professor Lutjeharms for the loan of phalloid literature and to the many others, especially in the Division of Botany and Plant Pathology, who have been of assistance in one way or another.

GLOSSARY OF TERMS.

- Acuminate..... gradually narrowed to a point.
 Adnate..... closely attached.
 Allantoid..... (of spores) sausage-shaped.
 Alveolate..... marked with honeycomb-like hollows.
 Anastomose..... to run together forming a net-work.
 Annular..... ring-like.
 Apiculus..... a short projection at one end of a spore.
 Apophysis..... (of Geasters) a ring-like swelling at the base of the endoperidium.
 Appressed..... closely flattened against the surface.
 Areolate..... marked out in small areas.
 Asperate..... rough with small points or granules.
 Asperulate..... diminutive of *asperate*.
- Basidium..... the spore-producing organ in the Basidiomycetes.
 Byssoid..... cottony; made up of fine threads.
- Caducous..... falling off early.
 Caespitose..... crowded in dense clusters.
 Campanulate..... bell-shaped.
 Capillitium..... a mass of sterile thread-like tubes or fibres mixed with the spores.
 Cartilaginous..... firm and tough but readily bent.
 Cinereous..... ashy-grey or drab-grey.
 Circumscissile..... opening or cracking along a circle.
 Citriform..... lemon-shaped.
 Clathrate..... latticed; like a net-work.
 Clavate..... club-shaped.
 Columella..... a sterile central axis within a mature fruit body.
 Conical..... cone-shaped.
 Connivent..... contacting but not organically united.
 Continuous..... (of capillitium) non-septate; (of spores) one-celled.
 Coriaceous..... leathery in texture.
 Crenulate..... having the edge delicately toothed with rounded teeth.
 Cupulate..... cup-shaped.
 Cyathiform..... like a cup with a flared edge.
 Cystidia..... sterile cells, usually large and hyaline, projecting from the hymenium in many Basidiomycetes; rare in Gasteromycetes.
- Daedaloid..... with elongate and sinuous mouths as in *Daedalea*.
 Definite..... (of a stoma, pore, mouth) with margin clearly defined.
 Dehiscence..... mode of opening at maturity for the discharge of spores.
 Deliquesce..... to liquefy at maturity.
 Dendroid..... tree-like in form, c.f. the columella in *Gymnoglossum*.
 Diaphragm..... a membrane separating the gleba from the sterile base in some species of *Calvatia* and *Lycoperdon*.
 Dichotomous..... repeatedly forking into two more or less equal arms.
 Duct..... elongated cell.
- Echinate..... with sharp pointed spines.
 Echinulate..... with minute and finely pointed spines.
 Elaters..... bodies with spiral or annular markings in the gleba of *Batarrea*.
 Elliptical, Elliptic..... oblong with rounded ends.
 Endoperidium..... the inner layer of the wall which in the Gasteromycetes encloses the gleba.
 Epigeous, Epigean..... growing on the surface of the ground.
 Epiphragm..... the thin membrane covering the mouth of the young fruit body in the Nidulariaceae.
 Epispore..... the outer wall of the spore.
 Evanescent..... soon disappearing.
 Exoperidium..... outermost layer of the wall which in the Gasteromycetes encloses the gleba.
 Exospore..... a gelatinous membrane covering the epispore.
- Farinose..... covered with mealy particles.
 Fasciculate..... applied to the persistent fascicles of basidia in *Podaxis* and *Phellorina*.
 Ferruginous..... rusty brown.
 Fibril..... a very small fibre.
 Fibrillose..... (of a stoma) enclosed within a zone of silky, parallel fibrils arranged radially.

Filiform.....	thread-like.
Fimbriate.....	fringed.
Fissured.....	split.
Fistulose.....	tubular, hollow.
Floccose, Flocculent...	delicately cottony.
Fornicate.....	(of the Geastreae) arched; applied to species in which the fibrous and fleshy layers split from the mycelial layer—which remains as a cup on the ground—and become arched above it.
Fragment.....	break in pieces.
Fugacious.....	soon disappearing.
Fulvous.....	reddish cinnamon brown; tawny.
Funiculus.....	(of Nidulariaceae) the cord of hyphae by which the peridioles are at first fixed to the peridium.
Furfuraceous.....	scurfy; covered with bran-like particles.
Fuscous.....	smoky drab; dusky.
Fusiform.....	thick in the centre and tapering to a point at each end.
Glabrous.....	smooth, free from hairs, scales, etc.
Gleba.....	the spore mass enclosed within the peridium, composed of cavities lined with the hymenium.
Gregarious.....	growing in groups.
Guttule.....	(in spores) oil globule.
Hyaline.....	colourless and transparent or nearly so.
Hygroscopic.....	readily absorbing moisture from the air.
Hymenium.....	the spore-bearing layer lining the cavities formed by the tramal plates; commonly composed of a palisade of basidia.
Hypogaeous.....	growing below the surface of the ground.
Imbricate.....	overlapping one another like the tiles on a roof.
Indefinite.....	applied to a stoma which is not delimited by a definite tissue; it appears merely as an aperture.
Indehiscent.....	applied to plants with no special method of opening.
Indigenous.....	native to a country.
Indusium.....	a membrane in <i>Dictyophora</i> which hangs from the apex of the stipe beneath the pileus.
Involute.....	with margins rolled inwards.
Labyrinthiform.....	tortuous, like a labyrinth.
Laciniate.....	cut or torn into lobes.
Lactiferous ducts.....	ducts having a milk-like juice.
Lacunose.....	covered with pits or indentations.
Lamellate.....	made up of thin plates.
Laminated.....	consisting of plates or layers.
Lanceolate.....	many times longer than broad and tapering.
Lenticular.....	shaped like a double convex lens.
Mammose.....	with breast-like protuberances.
MM.....	millimetre, approximately 1/25 of an inch.
Micron.....	1/1000 of an inch indicated by the Greek μ .
Monosporus.....	bearing one spore.
Mouth.....	(of a peridium) the stoma or pore through which spores are discharged.
Mycelium.....	a mass of hyphae.
Naked.....	applied to a stoma (mouth, pore) which is not enclosed within a peristome.
Nomen conservandum..	name conserved by the International Botanical Congress.
Obconic.....	with the appearance of a cone held upside down.
Obovate.....	egg-shaped, with the broader end uppermost.
Ochraceous.....	ochre-yellowish.
Olivaceous.....	with an olive tint; yellowish olive.
Organically united....	applied to tissues which fuse together so as to form one completely united structure.
Ovate, Ovoid.....	egg-shaped, with the broader end at the base.
Palisade.....	applied to elongated cells arranged close together in parallel fashion.
Papillate.....	with the surface provided with small rounded processes.

Papyraceous.....	papery, resembling parchment.
Pedicel.....	a small stalk.
Pedicellate.....	borne on a pedicel.
Percurrent.....	extended through the entire length.
Peridiole.....	(of the Nidulariales) a body containing spores and enclosed within the peridium.
Peridium.....	a wall or membrane enclosing the fruit body.
Peristome.....	an edging round an opening, e.g. stoma, mouth of endoperidium.
Phalloid.....	resembling the genus <i>Phallus</i> .
Pileate.....	having a pileus or cap.
Pitted.....	with small depressions.
Plane.....	(of a stoma) flat, not projecting above the surface.
Plicate.....	(of the peristome) pleated.
Polygonal.....	many angled.
Pore.....	an opening in the endoperidium to allow for the discharge of spores.
Prosenchymatous.....	consisting of long cells or filaments.
Pruinose.....	having a frost-like or powdered surface covering.
Pseudoparenchyma.....	looking like true parenchyma but formed of hyphae.
Pubescent.....	having soft hairs.
Pulverulent.....	powdery.
Pulvinate.....	cushion-shaped.
Punctate.....	marked with very small spots or depressions.
Punky.....	soft and tough; corky.
Pyriform.....	pear-shaped.
Radicate.....	rooting.
Receptacle.....	(of the Phallaceae) the stem-like or clathrate structure on which the spore masses are borne.
Recurved.....	curved backwards and downwards.
Reticulated.....	with net-like, raised markings.
Revolute.....	rolled back from the apex.
Rhizomorph.....	a thread- or cord-like structure formed of compacted hyphae.
Rimose.....	cracked.
Rugose.....	wrinkled.
Rugulose.....	delicately wrinkled.
Saccate.....	like a sac or bag.
Scabrous.....	rough with fine projections.
Scissile.....	splitting.
Septa.....	cell walls or divisions.
Septate.....	having dividing walls.
Sculpturing.....	applied to the various surface markings of spores.
Sessile.....	without stem, sterigma or pedicel.
Simple.....	(of the capillitium) with unbranched threads.
Sinuous.....	wavy.
Spicule.....	a small, erect point.
Spinulose.....	with small spines.
Squamule.....	a small scale.
Sterigma.....	a slender process by which a spore is attached to the basidium.
Sterile base.....	applied to the non-spore-bearing tissue at the base of the spore mass.
Stipitate.....	stalked.
Stoma.....	an opening in the endoperidium through which spores are discharged.
Striate.....	marked with delicate lines, grooves or ridges.
Stroma.....	(of <i>Broomeia</i>) a compact mass of vegetative hyphae in which the fruiting bodies are partly embedded.
Strigose.....	rough with sharp-pointed, stiff hairs.
Subclavate.....	not quite club-shaped.
Subcoriaceous.....	approaching leathery in texture.
Subiculum.....	a felted growth of mycelium on which fruiting bodies are borne.
Substratum.....	the material on or in which a saprophyte lives.
Sulcate.....	fluted or grooved.
Synonym.....	another name for a species, especially a later or invalid name.
Tomentose.....	having a covering of soft hairs.
Tramal Plates.....	the plates of the gleba which carry the hymenium.
Truncate.....	abruptly cut off.
Tubercular.....	having small, wart-like processes.
Tuberiform.....	tuber-shaped.

Tunica.....	(of Nidulariaceae) a thin white membrane covering the peridiole ; (of spores a gelatinous membrane covering the episore.
Turbinate.....	top-shaped.
Umbilicate.....	with a central navel-like depression.
Umbo.....	a boss or raised central swelling.
Umbonate.....	with a boss or umbo.
Urceolate.....	pitcher-like in shape.
Utricle.....	a bladder-like covering or appendage.
Veil.....	see indusium.
Velutinate.....	like velvet due to a covering of fine, soft hairs.
Verrucose.....	having small rounded processes or warts.
Verruculose.....	diminutive of verrucose.
Vesicle.....	a bladder-like sac.
Volva.....	a cup-like structure round the base of a mature stipe or receptacle—the lower part of the universal veil which covers the young fructification.
Wing.....	(of <i>Polyplocium</i> and <i>Gyrophragmium</i>) a minute membranous expansion of the tramal plates.

GASTEROMYCETES.

Key to the Orders.

- Plants usually hypogeous and sessile. Gleba compact and firm, of tramal plates which are sometimes separate but usually anastomose to form cavities lined with the hymenium. Capillitium wanting.....I. HYMENOGASTRALES.
- Plants epigeous, usually of bright colours, bizarre shapes and with an offensive odour. Gleba mucilaginous, usually exposed at maturity, borne on a specialised, pseudo-parenchymatous, spongy, brittle receptacle arising from the base of a cup-shaped volva. Capillitium wanting.....II. PHALLALES.
- Plants epigeous, sessile or borne on a pseudo-stem. Gleba enclosed in a peridium, consisting of cellular tissue with cavities lined by a poorly developed hymenium, finally breaking down into a mass of pulverulent spores. Capillitium wanting. .III. SCLERODERMALES.
- Plants epigeous, sessile or with well-developed stem. Gleba enclosed in a peridium, breaking down at maturity into a mass of powdery spores which are mixed with well-developed capillitium consisting of simple or branched threads.....IV. LYCOPERDALES.
- Plants epigeous, sessile or nearly so, cupulate or depressed-globose. Gleba enclosed in peridiola, borne with dehiscent peridia. Capillitium wanting.....V. NIDULARIALES.

Key to the Families and Genera.

Order 1.—HYMENOGASTRALES.

Family 1.—**HYMENOGASTRACEAE**.—Peridium sessile, attached to substratum by one or several basal and/or lateral rhizomorphs.

Sub-family **HYMENOGASTROIIDEAE**.—Gleba cellular, without a branched columella.

Peridium attached by lateral rhizomorphs.

Spores elliptical and smooth.

Spores hyaline or tinted only..... 1. **Rhizopogon**.

Spores dark coloured..... 2. **Melanogaster**.

Spores globose and verrucose..... 3. **Sclerogaster**.

Peridium attached by basal rhizomorphs.

Spores elliptical..... 4. **Hymenogaster**.

Spores globose..... 5. **Octaviania**.

Spores many angled..... (*Richoniella*).

Sub-family **HYSTERANGIOIDEAE**.—Gleba cellular, traversed by a simple or branched columella.

Spores globose, echinulate..... 6. **Hydnangium**.

Spores elliptical.

Spores smooth..... (*Hysterangium*).

Spores areolate or verrucose..... 7. **Gymnoglossum**.

Spores longitudinally ribbed..... (*Gautieria*).

Family 2.—**SECOTIACEAE**.—Peridium stipitate, stem traversing the gleba as a simple, well-defined columella.

Tramal plates sparingly to frequently anastomosed to form cavities lined with hymenium.

Gleba entirely covered by the peridium..... 1. **Secotium**.

Gleba partially covered by the peridium..... 2. **Macowanites**.

Tramal plates separate, vertically suspended from apex of peridium, exposed at maturity.

Plants massive, with large volva at base of columella..... 3. **Polyplocium**.

Plants slender, with small volva-like structure at base of stem.... 4. **Gyrophragmium**.

Order II.—PHALLALES.

Family 1.—**CLAUSTULACEAE**.—Receptacle on obovate hollow sphere enclosing the spore mass.

Characters of the family..... (*Claustula*).

Family 2.—**PHALLACEAE**.—Receptacle a simple, hollow, cylindrical stem, the spore mass borne directly on the apical portion or on a campanulate pileus attached to the apex.

Spore mass borne directly on the upper part of the receptacle.

Spore mass covering the apical portion of the receptacle..... 1. **Mutinus**.

Spore mass forming a collar-like restriction below the inflated apex of the receptacle..... (*Staheliomyces*).

Spore mass covering a net-like pileus loosely attached to the upper part of the receptacle..... (*Floccomutinus*).

Spore mass borne on a campanulate pileus.

Indusium absent or rudimentary.

Pileus formed of radiate plates..... (*Aporophallus*).

Pileus formed of lamellate plates..... 2. **Itajahya**.

Pileus externally rugulose, papillate or reticulate..... 3. **Phallus**.

Indusium present, well developed..... 4. **Dictyophora**.

KEY TO FAMILIES AND GENERA.

Order III.—SCLERODERMALES.

Family 1.—**CALOSTOMATACEAE**.—Peridium borne on a prominent pseudo-stem, 3-layered, dehiscing by an apical stoma. Spore mass at maturity within the endoperidium which becomes attached to the apex of the peridium.

Characters of the family..... (*Calostoma*).

Family 2.—**SCLERODERMATACEAE**.—Peridium sessile or borne on a pseudo-stem, 1-2-layered, dehiscing by irregular fissuring of the apex. Spores at maturity a powdery mass which is free within the peridium or within small chambers formed by persistent gelatinised tramal walls.

Spores free within the peridium..... 1. **Scleroderma**.

Spores free within small chambers formed by persistent tramal walls.. 2. **Pisolithus**.

Family 3.—**ARACHNIACEAE**.—Peridium sessile, 1-layered, dehiscing by disintegration at maturity into a granular mass consisting of minute, separate, hollow peridioles formed of persistent tramal plates lined with hymenium to which the spores are attached.

Characters of the family..... **Arachnion**.

Order IV.—LYCOPERDALES.

Family 1.—**LYCOPERDACEAE**.—Peridium sessile or carried upon a pseudo-stem, a true stem being absent.

A.—*Mesophelliae*.—Peridium indehiscent, of two or three layers; capillitium unbranched. Spores globose or elliptical, usually with a gelatinous exospore which may appear warted or reticulated.

Spores elliptical, smooth or irregularly roughened.

Gleba with a central core..... (*Mesophellia*).

Gleba without a central core..... (*Castoreum*).

Spores globose, reticulated..... (*Abstroma*).

B.—*Lycoperdaee*.—Peridium 1-2-layered, dehiscing by an apical pore or by irregular rupture of the apex. Capillitium simple or freely branched. Spores typically globose and verrucose.

Plants usually few, single or caespitose.

Capillitium threads more or less smooth, simple or sparingly branched.

Plants dehiscing by an apical pore.

Capillitium threads long, simple or sparingly branched, attached to the endoperidial wall..... 1. **Lycoperdon**.

Capillitium threads simple or branched, free within the peridium..... 2. **Disciseda**.

Plants dehiscing by rupture or disintegration of the apex.

Capillitium pulverulent or compact. Sterile base usually present. Endoperidium usually thick and tough... 3. **Calvatia**.

Capillitium compact. Sterile base lacking. Endoperidium thin, papery, brittle. Plants becoming detached at maturity..... 4. **Lanoplia**.

Capillitium threads freely branched, consisting of a thick stem with sharp pointed, tapering, thinner branches..... 5. **Bovista**.

Capillitium threads short, spiny, free within the peridium. Endoperidial wall thick and corky..... 6. **Mycenastrum**.

Plants numerous, borne on a common stroma, whole cluster originally covered by an universal exoperidium.

Peridia separated from one another by alveolar walls.. 7. **Broomelia**.

Peridia separated from one another by the cuplike remains of individual exoperidia which originally covered them..... (*Diplocystis*).

- C.—*Geastreac.*—Peridium of 4 layers. Exoperidium splits into segments in stellate manner. Endoperidium dehisces by one or more pores or by rupture of the apex. Capillitium threads simple or branched. Spores typically globose and verrucose to echinulate.
- Dehiscence by a single apical pore..... 8. **Geastrum.**
 - Dehiscence by several apical pores..... 9. **Myriostoma.**
 - Dehiscence by rupture of the endoperidium..... 10. **Geasteropsis.**

Family 2.—**TULOSTOMATACEAE.**—Peridium borne on a well-developed stem, which in *Podaxis* traverses the gleba as a columella.

Sub-family *TULOSTOMOIDEAE.*—Basidia not in fascicles, disappearing at maturity.

- A.—*Tulostomeac.*—Elaters not present in the gleba.
- Peridium dehiscing by a definite apical pore..... 1. **Tulostoma.**
 - Peridium dehiscing by irregular fissuring of the apex..... (*Schizostoma*).
- B.—*Batarreac.*—Elaters present in the gleba.
- Peridium dehiscing by circumscissile cleavage of the apical portion.. 2. **Batarrea.**

Sub-family *PODAXONOIDEAE.*—Basidia in fasciculate clusters, persisting at maturity.

- C.—*Phellorineac.*—Peridium seated on the expanded apex of the stem.
- Peridium continuous with the stem..... 3. **Phellorina.**
 - Peridium not continuous with the stem.
 - Peridium dehiscing by a definite stoma, gleba pulverulent..... 4. **Chlamydopus.**
 - Peridium dehiscing by irregular breaking away of the apical part ; gleba coarsely chambered..... 5. **Dictyocephalos.**
- D.—*Podarineac.*—Peridium carried at the apex of a stem which traverses the gleba as an axile columella ; dehiscing by longitudinal splitting.
- Characters as above..... 6. **Podaxis.**

Order V.—NIDULARIALES.

Family 1.—**NIDULARIACEAE.**—Peridioles many, embedded in mucilage within the peridium or attached to the peridial wall by funiculi.

- Peridioles attached to the cups by funiculi.
- Peridium 1-layered..... 1. **Crucibulum.**
 - Peridium 3-layered..... 2. **Cyathus.**
- Peridioles without funiculi.
- Peridium cup-shaped, with an epiphragm..... (*Nidula*).
 - Peridium subglobose, without a typical epiphragm..... (*Nidularia*).

Family 2.—**SPHAEROBOLACEAE.**—Peridioles solitary, forcibly discharged from the peridium at maturity.

- Characters of the family..... 3. **Sphaerobolus.**

HYMENOGASTRALES.

Plants epigeous or hypogeous, indehiscent, sessile or stipitate, usually attached to the substratum by one or several rhizomorphs. Peridium 1-3 layered, sometimes disappearing at maturity. Gleba compact and firm, composed of tramal plates anastomosed to form numerous cavities which may be subglobose, elliptical, triangular or labyrinthiform. Traversed or not by a percurrent or branched columella. Tramal plates fleshy, cartilaginous or sometimes gelatinised, formed of pseudoparenchyma or interwoven hyphae. Basidia continuous with the tramal plates, usually forming a compact palisade hymenium lining the cavities, cylindrical or subclavate, permanent or soon breaking up, 2-8-spored. Spores borne on long or short sterigmata, globose or elliptical, smooth or rough, hyaline or coloured.

The characters which distinguish this order from others are the compact, indehiscent gleba, the tramal plates which anastomose to enclose cavities lined with the hymenium and the absence of capillitium threads.

The order contains two families, HYMENOGASTRACEAE and SECOTIACEAE, which are separated from each other mainly on the presence or absence of a stem and the texture of the mature plant. In the Hymenogastraceae the plants are sessile, partly or entirely hypogeous and fleshy or gelatinous at maturity; members of the Secotiaceae are stipitate, the stem being continued through the gleba to the apex of the peridium as a columella, partly or entirely epigeous and usually woody when mature.

HYMENOGASTRACEAE de Toni

- in Saccardo, Sylloge Fungorum 7 (1888) 154.
- Zeller and Dodge, Ann. Miss. Bot. Gard. 5 (1918) 1.
- Coker and Couch, Gastero (1928) 15.
- Ed. Fischer, Natürlichen Pflanzenfamilien 2, 7a (1933) 9.
- G. H. Cunningham, Gasteromycetes of Australia and New Zealand (1944) 42.
- Hysterangiaceae* Fischer, Nat. Pflanzenfam. 1** 1 (1900) 304.
- Rhizopogonaceae* Dodge, Comp. Morph. Fungi (1928) 468.
- Hydnangiaceae* Dodge, l.c. p. 485.
- Melanogastraceae* Fischer, Nat. Pflanz. 7a (1933) 9.

Plants hypogeous or epigeous, subglobose, depressed globose, obovate or tuberiform attached to the substratum by basal or lateral rhizomorphs. No true stem present. Indehiscent, disintegrating into a slimy mass at maturity. Peridium 1-2 layered. Gleba of fleshy or gelatinised tramal plates anastomosed to form subglobose, elliptical or labyrinthiform cavities lined with the hymenial layer and at maturity partly or completely filled with spores. Basidia subclavate or cylindrical, 1-8-spored. Sterigmata short or long. Spores globose or elliptical, smooth or rough, hyaline or coloured.

About 45 genera have been described for this family, but of these only seven have so far been recorded for Southern Africa, though it is very probable that a systematic search for these plants would lead to the discovery of others. With the exception of *Rhizopogon*, the individual species are likewise very poorly represented, occurring in only a few widely separated areas. Up to the present they have only been found in the coastal areas of the Cape Province, in Natal and in Southern Rhodesia—none in the Transvaal Province where the present work is being conducted. With only a few dried or formalin-preserved specimens available for examination and no overseas material for comparison, it has been impossible to study this family more than very imperfectly. G.H. Cunningham, l.c., Ed. Fischer, l.c., Zeller and Dodge, l.c. and Coker and Couch, l.c., have been the main sources of reference in studying this group, the classification and keys of the first-mentioned having been selected as most suitable for use with specimens in this country.

Key to the Genera.

Hymenogastroidae. Gleba cellular, without a columella.

Rhizoideae. Peridium attached to the substratum by lateral rhizomorphs.

Spores elliptical, smooth.

Spores hyaline or tinted only..... 1. **Rhizopogon.**

Spores deeply coloured..... 2. **Melanogaster.**

Spores globose and verrucose..... 3. **Sclerogaster.**

Hymenogastreae. Peridium attached to the substratum by basal rhizomorphs.

Spores elliptical..... 4. **Hymenogaster.**

Spores globose..... 5. **Octaviania.**

Spores many-angled..... (Richoniella).

Hysterangioidae. Gleba cellular, traversed by a simple branched columella.

Spores globose and echinulate..... 6. **Hydnangium.**

Spores elliptical.

Spores smooth..... (Hysterangium).

Spores verrucose or areolate..... 7. **Gymnoglossum.**

Spored longitudinally ribbed..... (Gautieria).

1. RHIZOPOGON Fries.

Symbolae Gasteromycetum 1 (1818) 5 ; emended Tulasne, Giorn. Bot. Ital. 2 (1844) 56.

Hysteromyces Vitt. Not. nat. Civ. sulla Lombardia 1 (1844) 340.

Type species : *Rhizopogon luteolus* Fr.

Plants epigeous or hypogeous sub- to irregularly-globose or tuberiform, without a definite sterile base. Peridium tough, 1-2 layered, formed of interwoven hyphae which may or may not be gelatinised ; with few or many appressed or free, dark coloured rhizomorphs on the outer surface. Gleba usually some shade of brown, formed of tramal plates anastomosed to form cavities which in section are globose, oval, triangular, elliptical or labyrinthiform in shape. Columella absent. Tramal plates usually of interwoven hyphae which may be gelatinised or not, sometimes becoming scissile. Basidia permanent or soon disappearing, lining the cavities, sub-clavate to cylindrical, 2-8-spored. Sterigmata short. Spores smooth, elliptical with rounded ends, brown in mass, but individually only tinted.

The genus is characterised by the smooth, pale coloured, elliptical spores and the usually lateral or basal, dark coloured rhizomorphs. It is separated from *Melanogaster* on the colour of the spores, which are individually dark in the latter genus.

Of the 38 species described for this genus, Cunningham considers that not more than 12 are good species. Of these seven have been recorded for South Africa, but it is doubtful if more than two or three are distinct species. Work on this genus has been greatly handicapped by the lack of fresh material for examination, unfamiliarity with these plants and great divergence of opinion among workers on the specific characters.

Key to the Species.

Fresh plants finally yellowish to bay brown.

Gleba strongly gelatinised, drying hard..... 1. **R. luteolus.**

Fresh plants finally reddish brown.

Gleba fleshy, drying firm but not hard..... 2. **R. rubescens.**

Fresh plants dark to black.

Glebal cavities small..... 3. **R. niger.**

Glebal cavities large..... 4. **R. capensis.**

1 *Rhizopogon luteolus* Fries. [Plate I, fig. 1.]

Symbolae Gasteromycetum 1 (1815) 5, emended Tulasne, Giornal Botanica Italiana 2 (1844) 57.

de Toni in Sacc. Syll. Fung. 7 (1888) 161; Zeller and Dodge, Ann. Mo. Bot. Gard. 5 (1918) 10; Verwoerd, S. Afr. Journ. Sci. 22 (1925) 165; Coker and Couch, Gastero. (1928) 33; G. H. Cunningham, Gastero. (1944) 45.

Rhizopogon induratus Cooke, Grevillea 8 (1879) 59.

Melanogaster Wilsonii Lloyd, Myc. Notes (1923) 1176.

Rhizopogon Coxii Mueller, in Herb. Kew.

Plants sub- to irregularly globose or tuberiform, up to 4.5 cm. diam., "Pale ochraceous-tawny, deliquescent after rain, leaving a greenish-yellow mass of unpleasant odour" (sec. A. V. Duthie), drying very hard and ochraceous brown, bay brown or umber with lighter patches. Rhizomorphs usually well developed, dark or reddish brown or paler, laterally appressed, basally loose and strandlike. *Peridium* thick, 136–510 μ , of loosely interwoven, gelatinised threads, more compact outside than inside, pale golden brown in section. *Gleba* becoming hard; white then pale greyish or yellowish brown, finally between Ochraceous Tawny and Cinnamon Brown or dark amber brown, sometimes with waxy appearance; cavities usually small, 2–5 to mm., subglobose, straight or curved, elliptical, triangular, irregular to labyrinthiform, usually filled with spores. *Tramal plates* thick, 51–102 μ including the hymenial layer, often becoming scissile along centre, hyaline, of loosely interwoven, gelatinised threads. *Basidia* permanent, hyaline, cylindrical to subclavate, 6–8-spored, forming a compact layer lining the cavities; sterigmata short and threadlike. *Spores* smooth, pale greenish brown in mass in section, $4-8.5 \times 3-4 \mu$, elliptical with rounded ends, occasionally narrowed at one end or slightly irregular.

Habitat: in masses in ground, subhypogaeous.

Distribution: South Africa; North America; Asia; Australia; Europe; Tasmania; New Zealand.

Specimens examined: near Johannesburg, April 1911, I. B. Pole Evans, 1903; Stellenbosch, C.P., A. V. Duthie 77 (Kew ex Herb. C. G. Lloyd) 31335; in clayey ground near hedge, Stellenbosch Flats, Sept. 1919, A. V. Duthie 249, 31430; amongst pine trees, probably near Somerset East, 1882, MacOwan (Rabenh.-Wint. Fung. Eur. 3436; Kew) 20950 as *Melanogaster Owianum* (Missouri Bot. Gard. Herb. 5646 as *Rhizopogon pachyphloeus* Zeller and Dodge).

Specimens not seen: Bloemfontein, Verwoerd.

Dried specimens of this species are characterised by the hard texture of the gleba, the gelatinised hyphae of which the peridium and tramal plates are formed, the spore-filled cavities and the closely compacted basidia forming a permanent layer lining the cavities.

Zeller & Dodge, l.c., considered that *Melanogaster Owianum* Kalchbr. was the same as their species *Rhizopogon pachyphloeus*, but an examination of two specimens of the South African plant, represented by slices only, failed to disclose any character that could exclude it from *Rhizopogon luteolus* as described by G. H. Cunningham (l.c.) and it has therefore been transferred to the latter species. The two species would appear to be very closely related to each other, since in a previous instance Cunningham (Gastero. 1944: 46, 215) found that an Australian species identified by Dodge as *R. pachyphloeus* was *R. luteolus*. The South African plant differs from *R. pachyphloeus* in a thinner peridium, absence of obvious vesiculose hyphae in the peridium and the colour of the dried gleba, which is dull ochraceous brown, not black with a shiny surface.

2. *Rhizopogon rubescens* Tulasne. [Plate I, fig. 2.]

Giornal Botanica Italiana 2 (1844) 58.

de Toni in Sacc. Syll. Fung. 7 (1888) 161; Zeller & Dodge, Ann. Mo. Bot. Gard. 5 (1918) 18; Verwoerd, S. Afr. Journ. Sci. 22 (1925) 164; G. H. Cunningham, Gastero. (1944) 44.

Hysterangium rubescens Tulasne, Ann. Sci. Nat. Ser. II, 19 (1843) 375.

Melanogaster Berkeleyanus Broome, Ann. Mag. Nat. Hist. 15 (1845) 41.

Rhizopogon lapponicus Karst., Finska Bidr. Nat. Foll. 48 (1889) 19.

Plants gregarious or caespitose, subglobose, depressed to irregularly globose or tuberiform, to 3.2 cm. diam., cream coloured when underground, becoming tinged with red when exposed to the air or touched, drying ochraceous, olivaceous, or dark brown and rugulose; firm for a long time, finally deliquescent. Rhizomorphs cream, then reddish, finally dark as in the case of the plant body, usually few, sometimes almost wanting, appressed or loose, strand-like. *Peridium* uneven, comparatively thin, about 27–238 μ , golden brown to dark brown in section, of loosely interwoven hyphae approaching pseudoparenchymatous. *Gleba* cream, Honey Yellow to Isabella Colour, bay brown or umber, firm but soft to section; cavities 2–4 to mm., subglobose to sublabrynthiform, not filled with spores. *Tramal plates* hyaline to tinted yellow or pale brown in section, 34–85 μ thick, of loosely or compactly interwoven, fine, non-gelatinised hyphae, sometimes scissile. *Basidia* up to 13.6 μ long, “2–8-spored”, hyaline, subclavate or cylindrical. *Spores* elliptical with rounded ends, smooth, tinted, 6–9 \times 3–4 μ .

Habitat: in ground, hypogaeous.

Distribution: South Africa; North and South America; Asia; Australia; Europe; Tasmania; New Zealand.

Specimens examined: under *Pinus pinaster*, Jessievale Plantation, Tvl., Forester, 17095, said to be dug up and eaten by buck; du Toit's Park, Stellenbosch, Sept. 1919, Duthie 245, 31425; in sandy soil under pines, Pinelands, C.P., June 1929, E. L. Stephens 24845; hillside above Marais Park, Stellenbosch, June 1924, A. V. Duthie 337 (v. d. Byl 475) 31494; Sterkstroom, C.P., A. V. Duthie, 31399.

Specimens not seen: Keurboom Park, Newlands, E. L. Stephens 336; near Pipe Track, Muizenberg Mt., C.P., Oct. 1938, P. C. de Kock (E. L. Stephens 464); Capetown University Grounds, Rosebank, June 1935, E. L. Stephens 463; Capetown, MacOwan, Kew.

This species is distinguished from *R. luteolus* by the usually lesser number of rhizomorphs, the texture of the gleba, which is not gelatinised and firm but soft and easily sectioned, and the fact that the cavities are not filled with spores. No fresh specimens were available for examination and the above description was therefore made chiefly from dried plants. I am indebted to Miss E. L. Stephens for information with regard to the colour and texture of the fresh plant.

3. *Rhizopogon niger* (Lloyd) Zeller & Dodge.

Annals of the Missouri Botanical Garden 16 (1929) 122.

Hysterangium niger Lloyd, Myc. Writ. 7 (1923) 1173; Verwoerd, S. Afr. Journ. Sci. 22 (1925) 163.

Plants irregularly globose or elongated, drying 3 \times 1 \times 1.5 cm., externally black, covered with adhering sand. *Peridium* thin, 75–100 μ , composed of dark brown, thick-walled, nearly parallel hyphae, 2–3 μ diam. *Gleba* black, soft and sub-gelatinous when fresh, drying Brussels Brown with no greenish tint and probably hard. Cavities small

angular to elongated, not filled with spores. *Tramal plates* about 40–50 μ , highly gelatinised, traversed through the middle by a layer of deeply staining, closely woven hyphae, the remainder of the gelatin filled with irregularly placed, ellipsoidal to spherical, deeply staining cells which seem to have no visible connection either with the central strand or with each other. *Basidia* narrow filiform, crowding out between the superficial gelatinised cells of the tramal plates, mostly 3-spored. *Spores* brown in mass, slender, ellipsoidal, $7-9 \times 2-3 \mu$. (Description adapted from Verwoerd, l.c. and Zeller & Dodge, l.c.)

Habitat : hypogeous.

Distribution : South Africa.

Specimens not seen : Knysna, A. V. Duthie (Lloyd Myc. Coll. 22394, Type ; Lloyd Mus. 081 ; Dodge Herb. 353 ; Zeller Herb. 7246).

According to Zeller & Dodge, this species superficially resembles *R. piceus* ; the colour and texture of the gleba is much as in *R. pachyphloeus* but microscopically it is easily distinguishable from either.

4. *Rhizopogon capensis* Lloyd ex Verwoerd.

Verwoerd, South African Journal of Science 22 (1925) 165 ; Lloyd, Mycological Writings 7 (1924) 1321, nomen nudum.

Plants subglobose or irregularly globose, 2–6 cm. diam., dark coloured, soon deliquescent. Rhizomorphs abundant, especially towards the base, black. *Peridium* thick, 272–408 μ diam., persistent, subcoriaceous, yellowish brown, composed of interwoven hyphae, often vesiculose and with scattered, oblong olivaceous bodies scattered here and there. *Gleba* fleshy, composed of large cavities, raw umber brown. *Tramal plates* 68–102 μ thick, of interwoven hyphae. *Spores* elliptical, subhyaline, $6-8.5 \times 3-3.4 \mu$, smooth.

Habitat : subhypogeous, under pine trees ; said to be relished by slugs and millipedes.

Distribution : Western Cape Province, South Africa.

Specimens examined : Pinelands, E. L. Stephens 335 (formalin preserved specimens only).

Specimens not seen : in clayey soil under pine trees, Stellenbosch, C.P., Verwoerd, type ; Stellenbosch, Sept. 1924, A. V. Duthie (E. L. Stephens 416).

According to Miss E. L. Stephens, *R. capensis* can easily be distinguished from *R. rubescens* in the fresh condition. The fruit body and rhizomorphs of the former are both dark coloured, while those of the latter are cream coloured when underground, becoming tinged with red when exposed or touched. Further, *R. capensis* is usually much larger and deliquesces at an earlier stage, with the result that at maturity it is quite soft, while *R. rubescens* is still quite firm.

Uncertain Species.

Rhizopogon radicans Lloyd.

Mycological Writings 7 (1923) 1174.

Verwoerd, S. Afr. Journ. Sci. 22 (1925) 165.

Verwoerd, l.c., states concerning this species : "Lloyd who named this fungus, doubts very much whether it really is a distinct species. He considers it to be near to *R. provincialis*, from which it differs in having a short, thick, rooting base, which, when broken, is seen to be composed of brown hyphae without chambers or spores".

Specimen not seen : Knysna, C.P., A. V. Duthie (Lloyd Myc. Coll. 50861, Type).

2. **MELANOASTER** Corda.

in Sturm's Deutschlands Kryptogamen-flora 3 (1831) 1.

Uperhiza Bosc., Mag. Ges. Nat. Freunde 5 (1811) 88.

Bullardia Jungh., Linnaea 5 (1830) 408.

Argyllum Walbr., Fl. Crypt. Germ. 2 (1833) 874.

Type species : *Melanogaster variegatus* (Vitt.) Tul.

"Plants hypogean, subglobose or irregularly tuberiform; with branched rhizomorphs arising from the exterior of the peridium, more numerous basally. Peridium of a single tough layer of woven gelatinised hyphae, continuous with the tramal plates. Gleba of tramal plates anastomosed to form numerous polygonal or subglobose cavities, which are usually larger towards the centre and filled with spores at maturity; columella absent; hymenium of clavate, 2-8-spored basidia (commonly 2-4) irregularly distributed through a broad hyphal zone lining the cavities. Spores borne on short sterigmata, elliptical or lemon-shaped, deeply coloured, smooth, shortly pedicellate" (after Cunningham, Gastero. 1944 : 46).

This genus is distinguished from *Rhizopogon*, which it closely resembles superficially, by the dark spores. It is further characterised by the fact that the basidia are not compacted into a palisade hymenium, but are irregularly borne on interwoven hyphae which line the cavities.

According to the International Rules of Botanical Nomenclature, both the generic names *Uperhiza* and *Bullardia* antedate *Melanogaster*, but on Maire's proposal (Rec. Synop. v. Congres internat. Bot. 1930 : 120) it was agreed that the latter name should be treated as a *nomen conservandum* on the grounds that it had been in use for more than a century, whereas the other two had been ignored.

About ten species have been described for this genus, but Cunningham, l.c., considers that of these only four or five are probably good species, the others being synonyms of these or of species of *Rhizopogon* or *Hymenogaster*. So far only one collection of one species has been recorded for South Africa.

Melanogaster ambiguus (Vittadini) Tulasne. [Plate I, fig. 4.]

Fungi Hypogaei (1851) 94.

Coker & Couch, Gastero. (1928) 41; G. H. Cunningham, Gastero. (1944) 47.

Octaviania ambigua Vitt., Mon. Tuberacearum (1831) 18.

Plants hypogaeous, depressed-globose to irregularly tuberiform, 1.2-3.2 cm. wide, 0.8-1.9 cm. high, brown (Snuff Brown) drying very hard; rhizomorphs concolorous or darker, adpressed. Peridium single, less than 1 mm. thick, smooth to rugulose, drying very much dented. Gleba consisting of tramal plates anastomosed to form globose, subglobose to irregular cavities filled with spores at maturity. Tramal plates thin, ochraceous, at times almost obscured by the dark masses of spores, consisting of gelatinised, fine, interwoven threads. Spores purplish black in mass, dark brown individually, typically lemon shaped or fusiform, occasionally subglobose, smooth or obscurely verruculose, at times very shortly pedicellate, pedicel hyaline, broken off, 11.9-20 \times 7-10 μ diam. Smell very strong, resembling garlic.

Habitat : under cultivated garden plants.

Distribution : South Africa; North America; Europe; India; New Zealand.

Specimens examinea : under *Hydrangeas* in shade of oak trees, Howick, Natal, Nov. 1930 G. A. Gill, 25506.

3. **SCLEROGASTER** Hesse.

Hypogaeen Deutschlands 1 (1891) 84.

Sacc. Syll. Fung. 11 (1895) 170; Bataille, Bull. Soc. Myc. France 39 (1893) 180; Coker & Couch, Gastero. East U.S. & Canada (1928) 25; Ed. Fischer, Nat. Pflanzenfam. 7a (1933) 18.

Type species: *Sclerogaster lanatus* Hesse.

"Fructifications small, white, embedded in a thick, flocculent mycelium, attached by rooting fibrils; peridium usually soft; gleba usually pale yellowish, gelified, drying very hard, cavities small, usually filled with spores similar to *Leucogaster* in shape; basidia small cylindric to clavate, sterigmata short; spores small, thick-walled, spherical, appearing smooth under lower magnifications, but mostly minutely echinate to verrucose under higher powers" (after Zeller & Dodge, Ann. Mo. Bot. Gard. 23, 1936: 567).

According to Zeller & Dodge, l.c., "this genus seems to form a transition between *Leucogaster* and *Hydnangium* or *Arcangeliiella*. The spores are much smaller than the average in the above genera and have a relatively thicker wall. In some species there are faint suggestions of a columella but no lactiferous ducts have been seen. In general appearance the fructifications resemble *Leucogaster* but have very minute cavities. They have usually been included in *Hydnangium* (*Octaviania* Auct. non Vitt.) on account of the echinate spores".

Zeller & Dodge list ten species for this genus, three occurring in North America and the remainder in Europe. Up to the present only one species has been recorded for Southern Africa, viz. *S. salisburyensis* Verwoerd, collected in Southern Rhodesia.

Sclerogaster salisburyensis Verwoerd.

South African Journal of Science 23 (1926) 293.

Plants up to 6 cm. diam., globose or irregularly globose. *Peridium* thick, 1-3 mm., persistent, convoluted; dirty white. *Gleba* fleshy, drying hard, dirty cream coloured, consisting of numerous, small, irregular but definite cellular cavities; no sterile base. *Spores* globose, 10.8-14.4 μ diam., reticulated, hyaline, epispore 1.8 μ thick (translation from Verwoerd, l.c.).

Habitat: in ground in bushveld.

Distribution: Southern Rhodesia.

Specimen not seen: Salisbury, S. Rhodesia, Jan. 1924, *F. Eyles* 4104 (v. d. Byl 2224).

4. **HYMENOGASTER** Vittadini.

Monographia Tuberacearum (1831) 20.

de Toni in Sacc. Syll. Fung. 7 (1888) 168; Ed. Fischer in Engler & Prantl. Nat. Pflanz. I, 1** (1899) 308; 7a (1933) 14; Dodge & Zeller, Ann. Mo. Bot. Gard. 21 (1934) 628; G. H. Cunningham, Gastero. (1944) 47.

Hymenangium Corda, Icon. Fung. 5 (1842) 28.

Protoglossum Massee, Grevillea 19 (1891) 97.

Hysterogaster Zeller & Dodge ex Dodge, Comp. Morph. Fungi (1928) 488.

Type Species: *Hymenogaster citrinus* Vitt. (sec. Cunningham).

Hymenogaster Bulliardii Zeller & Dodge (sec. Zeller & Dodge, l.c.).

Plants partly or entirely hypogaeous, subglobose, irregularly globose, pyriform, attached to the substratum by basal rhizomorphs, fibrils rarely present. *Peridium* usually simple, 1-2 layered, prosenchymatous, pseudo-parenchymatous or of interwoven hyphae, usually

confluent with the tramal plates, indehiscent. Gleba usually some shade of brown, composed of tramal plates amastomosed to form sub-globose to irregular cavities lined with spore-bearing hymenium and arranged irregularly or more or less radiating from a small hemispherical or conical sterile base; columella absent. Tramal plates hyaline to coloured, usually gelatinised and loosely or closely pseudoparenchymatous, often scissile at the axis. Basidia cylindrical, 2-4-spored, long or short sterigmate. Spores coloured, usually some shade of brown, smooth or verrucose, rugose, alveolate or reticulate, with or without a more or less wrinkled utricle, ovate, ellipsoid, broadly fusiform, citriform, with or without an apiculus or pedicel.

The genus *Hymenogaster* is world wide in distribution, though more prevalent in the Northern than in the Southern Hemisphere. It differs from *Octaviania* and *Richoniella*, its nearest relatives, in having elliptical spores, from *Rhizopogon* and *Melanogaster* in its attachment to the substratum by basal instead of by lateral rhizomorphs and from *Hydnangium*, *Hysterangium*, *Gymnoglossum* and *Gautieria* in the absence of a columella.

Numerous species have been described for this genus, but probably not more than three or, at most, four of these have so far been found in South Africa, but a systematic search for these fungi would probably bring to light a number more.

The members of this genus have received little attention from South African mycologists up to the present. With the exception of a single specimen found on the damp walls of a dark cave in Natal, these fungi are only known from the western Cape Province and such few collections as have been available for examination consist of one or, at most, two dried specimens only. In addition to the paucity of material, the difficulty of placing these collections in species has been very great owing to the lack of any named specimens for comparison. Reliance for identification has therefore been placed entirely on published descriptions, which is very unsatisfactory owing to the variable nature of these fungi. The names used must therefore be considered to be of a tentative nature until fresh material and authentically named specimens are available for study.

The separation of the species has been based on spore characters rather than on the thickness of the peridium, as was done by Dodge & Zeller, l.c., owing to the very variable nature of this character at different ages of the fungus and in the dried and fresh condition.

For the guidance of future workers in South Africa, the Australian and New Zealand species have been included in the key, since these are more likely to occur in this country than European or North American species.

Key to the Species.

Spores smooth or nearly so, without utricle.

Spores small, 7-10 μ long.

Peridial wall of woven hyphae..... 1. *H. levisporus*.

Peridial wall of pseudoparenchyma..... (*H. fuliginosus*).

Spores 13-16 μ long.

Peridium reddish brown..... (*H. tasmanicus*).

Peridium golden yellow..... (*H. aureus*).

Spores 18-22 μ long..... (*H. fusisporus*).

Spores covered with a rugulose-areolate or verrucose utricle.

Peridium 2-layered..... (*H. viscidus*).

Peridium 1-layered.

Spores 12-16 μ long.

Spores elliptical; basidia 4-spored..... (*H. nanus*).

Spores fusiform; basidia 2-spored..... 2. *H. albellus*.

Spores 16-22 μ long..... 3. *H. Zeylanicus*.

Spores with a strongly reticulated utricle.

Endospore thick..... (*H. macrosporus*).

Endospore thin..... (*H. reticulatus*).

1. *Hymenogaster levisporus* Massee & Rodway.

Rodway, Proceedings of the Royal Society of Tasmania for the Year 1911 (1912) 30.

Hymenogaster Maidenii Rodway, Proc. Roy. Soc. Tasm. for 1920 (1921) 157.

Octaviania levispora Rodway, Proc. Roy. Soc. Tasm. for 1923 (1924) 157.

Plants irregularly globose, up to 3 cm. diam., whitish, drying buff-coloured and rugulose. *Peridium* thin, varying in thickness 68–204 μ , outline irregular, of closely woven hyphae, compact except on outside where more loosely interwoven, dark brown on the outside and golden brown next to the gleba. *Gleba* becoming brown, consisting of anastomosed tramal plates forming minute, irregular to labyrinthiform cavities filled with spores. *Tramal plates* 17–51 μ without the hymenium, hyaline, compact, of densely woven hyphae. *Sterile base* not seen. *Basidia* 4-spored. *Spores* when mature pale brown, elliptical or obovoid-elliptic, occasionally subglobose, 6.8–10.2 \times 4.4–5 μ , smooth.

Habitat : in soil.

Distribution : South Africa ; Australia ; Tasmania.

Specimens examined : sub-hypogaeous, Kirstenbosch, C.P., June 1934, E. L. Stephens 368, 27674, probably immature.

This species is distinguished by its whitish peridium (in fresh condition) and small, smooth spores.

2. *Hymenogaster albellus* Massee & Rodway. [Plate I, fig. 3.]

Massee, Kew Bulletin of Miscellaneous Information (1898) 126.

Sacc. & Sydow in Sacc. Syll. Fung. 16 (1902) 253 ; Rodway. Papers and Proc. Roy. Soc. Tasmania (1911) 28, (1923) 152 ; Dodge & Zeller Ann. Mo. Bot Gard. 21 (1934) 669 ; G. H. Cunningham, Gastero. (1944) 52.

Hymenogaster luteus Harkness, Proc. Calif. Acad. Sci. Bot. III, 1 (1899) 247—not Vittadini.

Plants irregularly subglobose, up to 5 cm. diam., drying areolately fissured or not at the apex, white, becoming pale buff, pale greyish ochraceous or umber and wrinkled or rugulose. *Peridium* thin, 34–204 μ , 1–2 layered ; the outer apparently disappearing with age, hyaline, irregular in outline, varying in thickness from 13–85 μ and formed of loosely interwoven hyphae ; the inner layer pale golden brown and of more or less the same texture as the hyaline layer and merging into it, or with a definite, darker, more compact zone of tissue adjacent to the hyaline, giving the peridium the appearance of being 3-layered. *Gleba* brown (between Sayal and Cinnamon Brown) attached to the peridium, consisting of tramal plates anastomosed to form numerous, small, 1–4 to mm., subglobose to irregular or sub-labyrinthiform cavities with parallel hymenium, filled with spores. *Tramal plates* 10.2–44 μ thick (up to 135 μ in formalin specimens) from tinted to golden brown, gelatinised, loosely interwoven to more or less compact except at the axils where pseudoparenchymatous and often scissile. *Basidia* 2-spored, short to long sterigmate. *Spores* when mature umber brown, lemon-shaped with obtusely papillate, often hyaline apex or ovoid-acuminate, sometimes broadly sub-fusiform, less often broadly oval, evenly covered, except for the apical papilla, with a utricle which is delicate and hyaline in the immature spore, becoming brown tinted and clearly defined with age, 13.6–20.4 \times 6.8–12 μ , sometimes apiculate or shortly pedicellate in young spores.

Habitat : entirely or sub-hypogaeous.

Distribution : South Africa ; Australia ; North and South America ; New Zealand.

Specimens examined : half buried in soil, Stellenbosch, C.P., Aug.–Sept. 1937, A. V. Duthie 209, 28866, det. Dodge & Zeller, l.c. ; A. V. Duthie 324, 28867, det. Lloyd as *H. lilacinus* Tul. ; Cape Town, July 1911, L. Perringuey, 1735 ; Groote Schuur, C.P., Aug. 1933, J. Acocks (E. L. Stephens 259) 35544.

This species is characterised by the thin, whitish peridium, the brown gleba and the brown, lemon-shaped to ovoid-acuminate spores provided with a delicate to clearly defined, even, hyaline to coloured, roughened or areolate utricle.

Lloyd's identification of *Duthie 324* as *H. lilacinus* was based entirely on Tulasne's figures of the gleba and spores of this species; Dodge and Zeller identified *Duthie 209* as *H. albellus*, and since the two collections appear to be of the same plant, with slight age differences, it has been decided to refer both to *H. albellus*. Subsequent workers may decide that collection No. 1735 is some species other than *H. albellus* as here defined, since the spores are larger, the utricle tinted and more clearly defined and the peridium thinner and without an outer hyaline layer.

3. *Hymenogaster Zeylanicus* Petch.

Annals of the Royal Botanic Gardens, Perideniya 6 (1917) 207.

Trotter, Sacc. Syll. Fung. 23 (1925) 599; Dodge & Zeller, Ann. Mo. Bot. Gard. 21 (1934) 676; G. H. Cunningham, Gastero. (1944) 52.

Plants pyriform, 1 cm. diam., greyish white, drying brownish and deeply rugulose to almost pitted. *Peridium* 170–306 μ thick including the hymenium, hyaline, delicate, easily separating from the gleba, formed of loosely interwoven, coarse, thin-walled, hyaline hyphae, the outer part with numerous, globose to irregular vesicular hyphal cells. *Sterile base* present, small, white, pulvinate. *Gleba* pale olivaceous brown, consisting of tramal plates anastomosed to form subglobose to irregular cavities more or less radiating from the sterile base; cavities small, 4 to 1 mm., adjacent to the sterile base, increasing in size to 1 mm. diam. towards the apex. *Tramal plates* hyaline, 6·8–102 μ thick including the hymenium, formed of loosely interwoven, coarse hyphae similar to the tissue in the inner part of the peridium. *Basidia* 2-spored, clavate, hyaline. *Spores* when mature brown, 15–24 \times 8·5–13·6 μ diam., broadly ovoid-fusiform or lemon-shaped, apex bluntly acuminate, base apiculate or shortly pedicelled, finely verrucose, covered, except at the apex, with a hyaline, faintly areolate utricle which is often laterally expanded at the base producing a truncate effect.

Habitat: hypogeous.

Distribution: Australia; Ceylon; New Zealand; ? South Africa.

Specimen examined: on damp sandstone walls of a dark cave, Noodsberg, Natal, May 1937, *R. P. Lawrence*, 28873; one specimen only, preserved in formalin.

This species is characterised by the large areolated spores and the hyaline, loosely interwoven peridium.

According to the original description of Petch, i.e., the basidia are monosporous, the spores 12–16 \times 8–9 μ and the tramal plates 10 μ thick; but according to Cunningham, who examined part of the type collection now in the Lloyd herbarium (No. 37975) these characters are incorrect.

It is not certain that the South African plant here described is *H. zeylanicus* since Cunningham makes no mention of any sterile base and Dodge & Zeller state that it is absent. However, until further material is available for study, it seems preferable to refer it tentatively to this species, to which it seems very closely related, than to erect a new species from a single specimen.

Doubtful Species.

Hymenogaster arenarius Tulasne.

Giornale Botanico Italiano 12 (1844) 55.

Tulasne, Fung. Hypog. (1851) 73; de Toni, Sacc. Syll. Fung. 7 (1888), 168; Soehner, Hedwigia 64 (1923) 192; Dodge & Zeller, Ann. Mo. Bot. Gard. 21 (1934) 674.

Hymenogaster pusillus Berk. & Broome, Ann. & Mag. Nat. Hist. I, 18 (1846) 75.
H. Suzukianus Henn., Engl. Bot. Jahrb. 32 (1902) 41.

"Fructifications spherical to obovate, about 1 cm. diam., white, unchanging, smoke grey in alcohol, drying Brussels brown; sterile base slight; peridium 200–320 μ thick when fresh, composed of large, thin-walled, hyaline hyphae 7–8 μ diam., drying to about 35–40 μ thick (in the type); gleba white, becoming smoke grey, cavities more or less spherical, radiating from the base; septa 70–100 μ thick, with trama proper about 22–35 μ thick, of large, thin-walled, compact prosenchyma, the cells of which are 3–5 μ in diameter, with a pseudoparenchymatous subhymenium; basidia 30–35 \times 5–7 μ , cylindrical, sterigmata long; spores ovoid- to ellipsoid-citriform, coarsely verrucose (6–8 warts to a spore length), apiculate, pedicellate, 11–18 \times 8.5–11 μ , rufous brown". (ex Dodge & Zeller, l.c.).

Habitat : "in sandy or gravelly soil in woods".

Distribution : "cosmopolitan in the northern hemisphere"; ? South Africa.

South African specimens : record only by Lloyd (Myc. Writ. 6, Myc. Notes 61, 1919 : 889) of specimen collected by Miss A. V. Duthie, locality not mentioned. Lloyd is uncertain of his determination and in view of the known distribution of the fungus, it seems very probable that it is not *H. arenarius*. Lloyd's very meagre description suggests that the fungus might possibly be *H. albellus*, which was collected by Dr. Duthie on at least two occasions.

5. OCTAVIANIA Vittadini.

Monographia Tuberacearum (1831) 15; emended Tulasne, Fungi Hypogaei (1851) 77
 Ed. Fischer, Nat. Pflanzenfam. 7a (1933) 17; Verwoerd, S. Afr. Journ. Sci. 22 (1925) 163; G. H. Cunningham, Gastero. (1944) 54.

Gymnomyces Mass. & Rodw. ex Mass. Kew Bull. (1898) 125.

Octavianina Kunze, Rev. Gen. Pl. 2 (1898) 501.

Martellia Matt., Malpighia 14 (1900) 42.

Stephanospora Pat., Bull. Soc. Myc. Fr. 30 (1914) 349.

Type species : *Octaviania asterosperma* Vitt.

Plants subglobose to pyriform, attached by a basal root. Peridium 1–2-layered, sometimes partly disappearing, composed of compact or loosely formed pseudoparenchymatous tissue or of interwoven hyphae. Gleba consisting of tramal plates anastomosed to form globose, elliptic or sub-labyrinthiform cavities filled or not with spores. Sterile base present or absent. Columella wanting. Basidia permanent or not, cylindrical or clavate, 2–4-spored, sterigmate. Spores hyaline to dark coloured, globose, echinulate, verrucose or reticulated.

G. H. Cunningham, l.c., supplies the following notes on this genus :—"The genus was erected by Vittadini to contain several species which all, save *O. asterosperma*, have since proved to belong to *Melanogaster*. In 1839 Wallroth erected *Hydnangium*, but as he did not clearly define the genus, most workers have regarded it as a synonym of *Octaviania*. Dodge (Ann. Missouri Bot. Gard. 1928 : 486) adopted a converse attitude and held *Octaviania* to be invalid since . . . 'the immature condition of a number of species was misinterpreted, and at one time the name of *Octaviania* was applied to them, incorrectly since it was originally used as a synonym of *Melanogaster*'. His treatment is at variance with the facts and the International Rules of Botanical Nomenclature. Fischer (Nat. Pflanz. 7a, 1933 : 17) clarified the position by showing that *Hydnangium* was based on a valid species differing from those placed under *Octaviania* in possessing a dendroid columella".

With regard to the synonyms listed above, Fischer treats *Gymnomyces* and *Martellia* as distinct genera but Cunningham considers that they are synonyms of *Octaviana* for the following reasons :—" *Gymnomyces* was erected to contain plants without a definite peridium ; but as this structure is present in the type specimens and in all collections of the species I have examined, the genus is invalid. *Martellia* possesses no feature of generic importance which would separate it from *Octaviana*, the absence of a sterile base and the arrangement of the glebal chambers being features present in many typical species of the latter genus ".

About twenty-four species have been described for the genus under discussion but not more than two are known to occur in South Africa.

Key to the Species.

- Peridium of pseudoparenchymatous tissue. Basidia disappearing..... 1. *O. africana*.
 Peridium of loosely interwoven, often vesicular hyphae. Basidia permanent.... 2. *O. flava*.

1. *Octaviana africana* Lloyd.

Mycological Writings 7, Myc. Notes 67 (1922) 1142.

Verwoerd, S. Afr. Journ. Sci. 22 (1925) 164.

Sclerogaster africanus Lloyd, Myc. Writ. 5, Letter 64 (1916) 4, nom. nud.

Arcangeliiella africana (Lloyd) Zeller & Dodge, Ann. Mo. Bot. Gard. 23 (1936) 614.

Plants subglobose, up to 2 cm. diam., dark brown, smooth, drying rugulose, attached by a short basal root. *Peridium* 1-layered, 68-136 μ thick, pseudoparenchymatous, fairly compact and more or less uniform, the outer cells slightly more compact than the inner. *Gleba* consisting of tramal plates anastomosed to form small, subglobose, oval or irregular cavities, reddish brown, the tramal plates paler than the spore masses which fill the cavities. No sterile base or columella seen. *Tramal plates* pale brown, 17-51 μ thick, usually compactly pseudoparenchymatous except at the axils where the cells are thin-walled, large and often scissile. *Basidia* not seen. *Spores* ochraceous to umber brown, globose, thick-walled, 15.3-20.4 μ diam., grossly echinulate, echinulae pyramidal or finger-like.

Habitat : in humus, sub-hypogaeous.

Distribution : South Africa.

Specimens examined : Forest Hall, Knysna, A. V. Duthie 97 (v. d. Byl 2097 ; Lloyd Myc. Coll. 7198) 31350.

This species is characterised by the single, uniform, pseudoparenchymatous peridium and the large, brown, grossly echinulate spores.

There seems to be some difference of opinion about this species. Lloyd, l.c., described the spores as globose and minutely tubercular reticulate, Verwoerd, l.c., as ovate and reticulate, Zeller and Dodge, l.c. as " ellipsoidal, alveolate, slightly foveolate under alveolate " ; in the portion of the type material examined by me they are definitely globose and grossly echinulate. Zeller & Dodge further differ in the matter of the peridium which they described as ' duplex, formed of loosely woven, septate hyphae ' with a combined thickness of 525-560 μ which is about four times the thickness of the peridium in the specimens seen by me. They also recorded the presence of lactiferous ducts and on this account transferred the specimens to their genus *Arcangeliiella*. Finally they quote *Duthie 325* as the collection on which Lloyd based his species, whereas this should be *Duthie 97*, *Duthie 325* being that named by Lloyd *Octaviana carnea* which also differs from their description in a thinner peridium, absence of lactiferous ducts and in having coarsely echinulate instead of ellipsoidal, alveolate spores. These differences suggest that the collection seen by Zeller and Dodge may have included more than one species or that a

confusion of specimens may have arisen. In any case it seems very improbable that the specimens seen by them are the same as that part of the type collection which Dr. Duthie presented to the National Herbarium at Pretoria.

The genus *Arcangeliiella* was erected by Zeller & Dodge for plants of the *Octaviania* and *Hydnangium* type which showed the presence of lactiferous ducts. Cunningham (Gastero, 1944 : 63), however, asserts that the latter may or may not be present in individual plants of the same collection and that therefore this character is not of generic value. For this reason, strengthened by the fact that no lactiferous ducts were found in the material examined, the specimens from which the above description was made have been referred back to *Octaviania africana* Lloyd.

2. *Octaviania flava* (Rodway) G. H. Cunningham.

Transactions of the Royal Society of New Zealand 67 (1938) 408.

G. H. Cunningham, Gastero. (1944) 57.

Gymnomyces flavus Rodway, Proc. Roy. Soc. Tasmania for 1917 (1918) 110.

Plants subglobose or irregularly tuberiform with several lobes, up to 10 mm. high, 18 mm. wide, white when preserved in formalin, attached by a basal rhizomorph. *Peridium* thin, probably about 120 μ , delicate, smooth, composed of loosely interwoven, coarse, hyaline, often vesicular hyphae. Gleba whitish, consisting of tramal plates anastomosed to form subglobose-elongated to labyrinthiform, relatively large cavities, up to 2 mm. long diam., not filled with spores and more or less radiating from a small sterile base. No columella present. *Tramal plates* hyaline, thick, 68–306 μ , composed of loosely interwoven, coarse, hyaline, often vesiculose hyphae. *Basidia* 2-spored, cylindrical or clavate, forming a parallel hymenium layer, sterigmate, sterigmata short, about 7 μ , stout. *Spores* globose, hyaline, echinulate, 10–16 μ diam. (Description from material preserved in formalin.)

Habitat : hypogeous.

Distribution : South Africa ; Australia ; Tasmania.

Specimens examined : on damp sandstone wall of dark cave, Noodsberg, Natal, May 1937, R. P. Lawrence, 28872.

This species is distinguished by the loosely interwoven hyphal peridium and tramal plates and the echinulate spores. The South African specimens appear to agree very well with Cunningham's description, i.e., of the species as far as the known characters are concerned. Information with regard to the colour of the fresh and the dry plant is not available.

6. *HYDNANGIUM* Wallroth.

in Dietrich's Flora Regni Borussici 7 (1839) 465 ; emended Ed. Fischer, Nat. Pflanzen fam. 7a (1933) 30.

G. H. Cunningham, Gastero. (1944) 63.

Arcangeliiella Cav., Nuovo Giorn. Bot. Ital. 7 (1900) 117.

Maccagnia Matt., Mem. R. Accad. Naz. Lincei, Ser. 5, 13 (1922) 17.

Type Species ; *Hydnangium carneum* Wallr.

" Plants subglobose or pyriform, attached by a radicate rhizomorph. *Peridium* simple often reduced, of woven gelatinised hyphae. Gleba of permanent tramal plates anastomosed to enclose labyrinthiform cavities, lined with a permanent palisade hymenium ; columella dendroid, arising from a well-defined sterile base. Spores globose, echinulate, pallid coloured ; basidia clavate, 1–4-spored, commonly 2-spored, sterigmate " (after Cunningham l.c.).

Cunningham supplies the following notes on the genus:—"As emended by Fischer, *Hydnangium* may be regarded as an *Octaviania* with the gleba traversed by a dendroid columella and a coralloid—not lacunar—type of development.

"*Arcangeliella* is regarded as a synonym, since it differs merely in the occasional presence of lactiferous ducts. These bodies may be present or absent in individual plants of the same collection, consequently they cannot be regarded as of generic value. Frequently when they are present, they cannot be detected in dried plants unless sections are specifically treated, which renders their use hazardous in diagnosis. Zeller & Dodge appeared to regard the lactiferous character of greater generic significance than the presence or absence of a columella, or shape and sculpturing of the spores. In the result, in their various papers they have placed under the genus species which belong to several genera."

"Twenty species of *Hydnangium* have been described, the majority doubtless being members of *Octaviania*."

So far as is known, only two species of this genus have been recorded for South Africa and of these one seems rather doubtful.

***Hydnangium carneum* Wallroth.**

in Dietrich's Flora Regni Borussici 7 (1839) 465.

G. H. Cunningham, Gastero. (1944) 63.

Octaviania carnea (Wallr.) Corda, Icon. Fung. 6 (1854) 361; Verwoerd, S. Afr. Journ. Sci. 22 (1925) 164.

O. Archeri Berk., Fl. Tasman. 2 (1860) 263.

Hydnangium Soderstromii Lagerh. ex Lagerh. & Pat., Bull. Soc. Myc. Fr. 9 (1893) 142.

Hydnangium Archeri (Berk.) Zeller & Dodge, Ann. Mo. Bot. Gard. 22 (1935) 371.

Octaviania columellifera Kobayasi, Bot. Mag. 51 (1937) 297.

Plants globose, to 15 mm. wide, 10 mm. high, drying ochraceous and rugulose. Peridium 34–102 μ thick, 2-layered, outer layer irregular, composed of compactly interwoven hyphae, inner layer reddish brown, of same texture as outer layer. Gleba ochraceous brown, consisting of tramal plates anastomosed to form subglobose, elliptic or sub-labyrinthiform cavities lined with permanent hymenial layer; cavities filled with spores or not. "With distinct sterile base" sec. Verwoerd. Columella not seen. Tramal plates 34–102 μ thick, reddish brown with paler centre, pseudoparenchymatous, usually compact except at axils where cells large and sometimes scissile. Basidia cylindrical to subclavate, permanent, 1–4-spored, with long sterigmata. Spores globose, pale ochraceous, thick-walled, strongly echinulate, echinulae pyramidal or finger-like, 10–2–17 μ diam.

Habitat: in ground.

Distribution: South Africa; Australia; Europe; New Zealand; Tasmania.

Specimens examined: Stellenbosch Flats, Stellenbosch, C.P., Sept. 1921, A. V. Duthie 325 (v. d. Byl 2096) 28871, det. Lloyd as *Octaviania carnea*.

According to Cunningham, this species is characterised by the large, sinuous cells of the gleba, the fragile, often evanescent peridium, which may be well developed, rudimentary or absent, and the large, coarsely echinulate spores. The dendroid columella, on the presence of which the species was removed from *Octaviania* to *Hydnangium*, was not seen by me nor apparently by Verwoerd, but, in view of the fact that Dr. Duthie sent part of her collection to Lloyd for determination and the material retained consists of only a few broken slices, it is quite possible that the latter were cut from the sides of the specimen and so do not show the columella. The sterile base was likewise not seen in the material available, but Verwoerd, l.c., records the presence of such in his description.

Uncertain Species.***Hydnangium nigricans* Kalchbrenner.**

Grevillea 10 (1882) 107.

Saccardo, Syll. Fung. 11 (1895) 172; Dodge & Zeller, Ann. Mo. Bot. Gard. 23 (1936) 592.

“Fructification 1.5×2 cm., depressed globose, drying black, smooth, no trace of sterile base or columella in sliced fructifications; peridium 260–270 μ thick, composed of large, thin-walled prosenchyma; gleba ochraceous-tawny, cavities small, septa thin, 14–15 μ between hymenia (in dried material) appearing as slender, irregular, gelified hyphae but perhaps similar to the peridium, badly collapsed; basidia about 30×11 , collapsing in the upper half on the separation of the spore; spores 12–19 μ in diameter, dark brown, with closely set, conical spines on a thick epispore” (description ex Dodge & Zeller, l.c.)

Habitat: under trees.

Distribution: South Africa.

Specimen not seen: in grass under Acacia trees at foot of Boschberg Mts., near Somerset East, C.P., *MacOwan 1211* (type in Kew Herb. and in Bot. Mus. Berlin).

The above specimen is probably not a *Hydnangium* in the sense of Cunningham, whose arrangement is followed here, since no columella was found in the specimen examined by Zeller & Dodge, unless, as happens in other cases of MacOwan's collections, the specimens consisted of slices cut from the sides of the fruit body, in which case neither sterile base nor columella, even if present, would be evident. No specimen of *H. nigricans* is lodged in any herbarium in South Africa.

It should be noted that Kalchbrenner quotes *MacOwan 1211* for both *MacOwanites agaricinus* and the plant in question.

7. GYMNOGLOSSUM Massee.

Grevillea 19 (1891) 97.

Cunningham, Gastero. (1944) 71.

Dendrogaster Buch., Hedwigia 40 (1901) 316.

Type Species: *Gymnoglossum stipitatum* Mass.

Plants subglobose or pyriform, attached to the substratum by a well developed basal rhizomorph. Peridium of one or two layers, pseudoparenchymatous. Gleba of pseudoparenchymatous tramal plates, anastomosed to enclose numerous cavities which are lined with a definite hymenial layer; traversed by a branched columella, which may be reduced to a sterile base with a few radiating trabeculae. Spores elliptical, coloured, with a rugulose exospore; basidia persistent, bearing 2–4 spores on short sterigmata” (after Cunningham).

The distinguishing characters of this genus are the branched columella and coloured elliptical spores. It differs from *Hymenogaster* in having a branched columella, but the latter is at times very poorly developed and it is therefore sometimes not easy to distinguish between the two genera.

Zeller & Dodge (Ann. Mo. Bot. Gard. 21, 1934: 684) used the name *Dendrogaster* in their work on the genus, but Cunningham, l.c., subsequently pointed out that Massee described *Gymnoglossum* from an incomplete specimen in which the peridium had fallen off, and, as the presence or absence of a peridium is the main difference between the two genera, *Gymnoglossum* has priority.

The genus in South Africa is at present known from only one small collection doubtfully named by Lloyd as *Hymenogaster radiatus* and later referred by Zeller & Dodge, l.c. p. 688, to *Dendrogaster*. This is now referred to *Gymnoglossum* in accordance with Cunningham's views.

Gymnoglossum radiatum (Lloyd) Bottomley n. comb.

Hymenogaster radiatus Lloyd, Myc. Writ. 7, Myc. Notes 73 (1925) 1304 ; Verwoerd, S. Afr. Journ. Sci. 22 (1925) 160.

Dendrogaster radiatus (Lloyd) Zeller & Dodge, Ann. Mo. Bot. Gard. 2 (1934) 688.

Plants hypogeous, 1-2.5 cm. diam., subglobose, without sterile base, drying very hard. *Peridium* single, dirty white, drying brown (between Sayal and Verona Brown) and very rugulose, tough and separating from the gleba. *Gleba* drying pale brown (Avellaneous to Wood Brown), hard, consisting of gelatinous tramal plates anastomosed to form cellular to labyrinthiform cavities and more or less radiating from the branches of the central columella. *Tramal plates* gelatinous, of fine, parallel, wavy hyphae, 35-100 μ diam. Cavities filled with spores. *Basidia* not seen, apparently soon shrivelling up. *Spores* broadly oval, truncate at the base where remains of the sterigmata often persist as short prongs, finely verrucose, surrounded by a gelatinous sheath, pale ochraceous brown, 12-15 \times 8-10 μ diam.

Habitat : in leaf mould at foot of tree.

Distribution : South Africa.

Specimens examined : Salisbury, S. Rhodesia, March 1920, *F. Eyles* 2530 (S. Rh. 3826) as *Hymenogaster radiatus* Lloyd 17795.

Excluded Species.

Protubera africana Lloyd.

Mycological Writings 6 (1920) 987.

Verwoerd, South African Journ. Sci. 22 (1925) 163.

An examination of part of the type collection, *Duthie* 233 (v. d. Byl 2094 ; Lloyd Myc. Coll. 22143) 31418, found in damp clayey soil on the Papegaaisberg at Stellenbosch, C.P., June 1919, kindly donated by the collector to the National Herbarium, indicated that as suggested by G. H. Cunningham (Gastero. 1944 : 213) the species was based on a phalloid egg. Further collections from the same area, attributed to Dr. Duthie, included in the van der Byl herbarium under the numbers 2501 (July 1927) and 2331 (June 1923) are probably the same fungus. These specimens were not found by me when going through Dr. v. d. Byl's Gasteromycetes.

SECOTIACEAE Tulasne.

Annales des Sciences Naturelles Ser. III, 4 (1945) 176.

emended Ed. Fischer, Natürliche Pflanzenfamilien 1**, 1 (1900) 299.

Plants finally partly or entirely epigeous, consisting of a subglobose, oval, obovate or conical peridium borne on a usually well-developed stem. Gleba compact, composed of numerous, permanent tramal plates, which arise from the peridium only or also from the columella and either anastomose frequently to form cellular or labyrinthiform cavities lined with spore-bearing hymenium, or anastomose sparingly to form more or less radially arranged, sub-lamellate plates, or remain separate forming vertically suspended, tooth-like processes of which all the surfaces are covered with spore-bearing hymenium. Stem long or short, solid, stuffed or hollow, prolonged as a columella through the gleba to the apex, where it often expands laterally and merges with the peridium ; attached to the substratum

by one or several stout, mycelial, cord-like structures. Basidia 1-4-spored, sterigmate, soon shrivelling. Cystidia occasionally present. Spores globose, subglobose, broadly oval, obovate, smooth or rough, hyaline or coloured.

Four genera have been included in this family, namely *Secotium*, *Macowanites*, *Polyplodium* and *Gyrophragmium*. The two latter genera do not seem altogether in place in this family but, other than creating a new family for which there does not seem sufficient justification, it is difficult to know where else to put them. Some justification for this arrangement may be found if the nature of the gleba in the four genera is taken into consideration. In *Secotium* and *Macowanites* it is typically, in part at least, long cellular, but in *Secotium agaricoides* and *S. obtusum* it approaches the lamellate form with the apical plates suspended vertically from the apex of the peridium. If one considers the separate tooth-like plates of *Polyplodium* and *Gyrophragmium* as interrupted, lamellate plates, the lamellate *Secotiums* might be considered as a transitional stage between *Secotium* and *Polyplodium*.

Key to the Genera.

Peridium stipitate, stem prolonged through the gleba as a simple, well defined columella.

Tramal plates sparingly to frequently anastomosed to form cavities lined with spore-bearing hymenium.

Gleba entirely covered by the peridium..... 1. *Secotium*.

Gleba partially covered by the peridium; basal part decurrent on stem and projecting below the margin of the peridium..... 2. *Macowanites*.

Tramal plates not anastomosed but separate, tooth-like, vertically suspended from the apex of the peridium, exposed at maturity.

Plants massive, with large, erect volva at junction between columella and stem-like base..... 3. *Polyplodium*.

Plants slender with small, volva-like structure at base of stem..... 4. *Gyrophragmium*.

1. SECOTIUM G. Kunze.

Secotium, eine neue Gattung der Gasteromycetes Trichogastres in Flora 23 (1840) 321.

Fischer, Nat. Pflanz., 7a (1933) 112; Verwoerd, Ann. Univ. Stell. 3 (1925) 16; Cunningham, Gastero. (1933) 77.

Endoptychum Czern., Bull. Soc. Imp. Nat. Moscou 18 (1845) 146.

Elasmomyces Cav., Malpighia 11 (1897) 414.

Artymenium Berk. in litt.

Type Species: *Secotium Guenzii* Kunze.

Plants finally epigeous, consisting of a solid, fleshy then punky, subglobose, oval conical, irregular peridium borne on a well-developed stipe. Peridium smooth, areolate or warted, enclosing the gleba, margin at first adpressed to the stipe, finally usually breaking away when smooth, lacerated or splitting. Dehiscence by separation of the margin of the peridium from the stem, followed by gradual disintegration. Stem central, long or short, traversing the gleba up to the apex as a simple, unbranched columella, either penetrating the gleba or at some distance from it, expanded laterally at the apex to merge with the peridium. Gleba cellular to sublamellate, composed of subglobose or elongated cavities formed by sparingly to frequently anastomosing permanent tramal plates, firmly attached to all parts of the peridium, the lamellate condition being reached in the case of sparingly anastomosed tramal plates. Basidia 4-spored. Spores smooth, subglobose, broadly oval or slightly obovate.

The taxonomic position of this genus has given rise to much difference of opinion. de Toni (Sacc. Syll. Fung. 7, 1888 : 52) placed it in the Podaxineae under the Lycoperdaceae. Fischer (Nat. Pflanz. 1**, 1, 1900 : 300) first included it with *Macowanites*, *Gyrophragmium* and *Polyplocium* in the Secotiaceae under the Hymenogastrineae, but subsequently (l.c. 7a, 1933 : 112) transferred the family Secotiaceae to the sub-order Podaxineae. Dodge on the other hand (Comp. Morph. Fungi, 1928 : 493) included it with *Podaxis* and *Hysterangium* in the Hysterangiaceae, while Conard (Mycologia 7, 1915 : 94) considered that it should be included in the Agaricaceae. Finally Cunningham (l.c. p. 78) whose arrangement is here followed, has placed *Secotium* in the family Secotiaceae of the order Hymenogastres on the grounds that it most nearly resembles members of this order, being separated only by the presence of a definite stem.

Thirty-three species have been described for this genus, but of these only two have so far been found in South Africa.

Key to the Species.

- | | |
|--|--------------------------------|
| Gleba cellular. Plants large, up to 13 cm. high..... | 1. <i>S. Gueinzii</i> . |
| Gleba sub-lamellate. Plants small, up to 4 cm. high..... | 2. <i>S. obtusum</i> . |

1. *Secotium Gueinzii* Kunze. [Plate II, fig. 1, 2. Plate III, fig. 1.]

Secotium, eine neue Gattung der Gasteromycetes Trichogastres in Flora oder Bot. Zeitt. 23 (1840) 321.

Berkeley in Hooker's Journ. Bot. 2 (1843) 200; Corda, Icon. 6 (1854) 29, Pl. VI, fig. 10-18; Sacc. Syll. Fung. 7 (1888) 52.

Plant sub-hemispherical, depressed globose or ovate, apex often depressed, 5-12 cm. wide, 3-13 cm. high without stipe, whitish, smooth or obscurely floccose, wrinkled at the base, areolate in the apical portion, originally united to the stipe, later breaking away either entirely or partially. In the latter case the stipe may be pulled to one side before finally becoming free or in some cases part of the peridium remains permanently attached to the stipe. When the peridium does not break away entirely from the stem, it remains on the ground, not raised on its stalk at all. The fruit body gradually disintegrates, the process being hastened by gnawing insects and by rain. *Peridium* thin, white, corky-membranaceous to floccose at base. Stipe concolorous, up to 6 cm. long, 1.5 cm. thick at apex and up to 2.5 cm. thick at base where it is enlarged, solid, punky, attached to the substratum by a substantial mycelial cord, prolonged through the centre of the gleba as a cylindrical columella, reaching the apex, where it expands laterally and merges with the peridium. Lower part of the columella free from the gleba but the upper part narrowing and penetrating it. Base of stem proper smooth or with floccose rings—the remains of the peridium left when the latter breaks away from the stem. *Gleba* fuscous to pale olivaceous-brown, cellular, composed of irregular, elongated cavities formed by anastomosed tramal plates. *Basidia* 4-spored. *Spores* smooth, subglobose, broadly oval or slightly obovate when apiculate or shortly pedicellate, with one large guttule, $11.9-13.6 \times 8.5-10.2 \mu$, tinted brown with dark epispore.

Habitat : in open ground.

Distribution : South Africa.

Specimens examined : Brakenfel nr. Belville, C.P., Dec. 1932, *J. P. H. Acocks* (E. L. Stephens 159); Nov. 1933 (E. L. Stephens 307); Stikland, C.P., May 1933 *J. P. H. Acocks* (E. L. Stephens 230); nr. Schuur's Drift, Capetown-Malmesbury road, April-June 1940, *J. W. Mathews & E. L. Stephens* (E. L. Stephens 528) 35531; ? Signal Hill, Capetown, May 1914, *W. J. Foley* (S.A. Museum).

Specimens not seen : Cape Flats, C.P., 1839, *Gueinzii*; Uitenhage, 1839, *Zeyher*.

I am indebted to Miss E. L. Stephens for the specimens from which the above description was made and for the information about the final disintegration of the plant.

This plant is distinguished by its large size, white colour, areolate peridium and cellular gleba.

2. *Secotium obtusum* Lloyd. [Plate III, fig. 2.]

in Stevenson and Cash, The new fungus names proposed by C. G. Lloyd, (1936) 193.

Peridium 6 mm.-5 cm. wide, 6 mm.-4 cm. high without stipe, broadly oval or irregularly obovate, usually becoming deeply hemispherical with rounded or truncate base or occasionally expanded, whitish, grey, pale ochraceous or sometimes tinged with ochraceous, more or less smooth at first, becoming slightly to deeply wrinkled, areolate or less often the outer layer cracking into large, thick, imbricate warts; 2-layered, inner layer thin, outer layer thin to moderately thick, tough or brittle, originally enveloping the whole plant, later breaking away completely or sometimes only partially from the base, exposing the very short, usually bulbous stipe. Margin of peridium rounded, entire, lacerated or splitting longitudinally into up to 9 fissures which extend up to two-thirds of the height of the peridium. *Stipe* whitish, very short, scarcely visible, usually bulbous, attached by a stout mycelial cord, traversing the centre of the gleba to the apex as a columella which is free from the gleba. *Columella* cylindrical, thin or thick, in the latter case internally fibrous-cellular, reddish brown in colour. In the case of lop-sided specimens, the columella may be angled. *Gleba* creamy white then greyish fuscous, in the early stages consisting of long irregular, sinuously walled chambers which become lengthened and narrowed until the tramal plates become closely compacted and sub-lamellate. The latter arise from all parts of the inner surface of the peridium and, when mature, radiate from the latter towards the centre, the ends terminating near the columella in an almost continuous surface. *Tramal plates* up to 1.5 cm. long, 9 mm. wide, length depending on the shape of the peridium and the position of the columella, pale greyish-brown to ochraceous. *Spores* attached to all surfaces of the tramal plates, at maturity forming a brown layer which is detachable from the plates and gives the gleba a laminated appearance of alternate brown spore layers and paler tramal plates; brown, globose or sub-globose, often apiculate or shortly pedicellate, obscurely sparsely verrucose, 5-6 μ diam.

Habitat: in open ground.

Distribution: South Africa.

Specimens examined: Knapdaar nr. Burghersdorp, C.P., April 1924, Gideon Joubert, 18113, type; in grey silt, Cornforth Hill, Barkly West, C.P., June 1936, J. P. H. Acocks 409, 28644.

This species is distinguished by its oval shape, greyish-fuscous, sub-lamellate gleba and brown spores. It differs from *S. agaricoides*, which it resembles externally, in shape, in the colour of the gleba and the size of the spores.

2. **MACOWANITES** Kalchbrenner.

Hedwigia 15 (Aug. 1876) 115.

Kalchbrenner, Grevillea 10 (1882) 107; Sacc. Syll. Fung. 7 (1888) 179; Fischer, Nat. Pflanz. 1, 1** (1899) 299, 7a (1933) 11; Zeller & Dodge, Ann. Mo. Bot. Gard. 6 (1919) 56, 23 (1936) 636; Verwoerd, S. Afr. Journ. Sci. 22 (1925) 166.

Macowania Kalchbrenner, Gard. Chron. N.S. 5 (June 1876) 785, non *Macowania* Oliver, Hooker Icon. 1 (1870) 49.

Hypochoanum Kalchbr., Gard. Chron. N.S. 6 (July 1876) 140.

Type Species: *Macowanites agaricinus* Kalchbr.

Peridium epigean, subhemispherical when young, pileate at maturity, fleshy, stipitate. Stipe prolonged through the centre of the gleba to the apex as a columella. Gleba arising from the stipe as well as from the peridium, decurrent, projecting below the margin of the peridium, composed of unequal, subglobose to elongated cavities formed by anastomosed tramal plates, the basal cavities open to the outside, finally more or less radiating from the stipe. Basidia 2-spored. Spores large, globose, echinulate.

This genus is probably monotypic and endemic to South Africa and, as far as is known, is represented by a single collection of possibly one specimen only, which was distributed to several herbaria in the form of slices.

In Transactions of the British Mycological Society 25 (1942) 334, J. Ramsbottom points out that *Hypochnanum* is the valid name for this genus on the grounds of priority but proposes that *Macowanites* (with *M. agaricinus* as type) be conserved because of general usage against *Hypochnanum*.

The systematic position of the fungus is uncertain and until fresh specimens and especially young stages of the fungus are available for study, cannot be established. The decision to place the genus tentatively in the Secotiaceae has been based on Kalchbrenner's description, which states that the plant is stipitate, the stipe being prolonged to the apex of the peridium in columella-fashion, a character shared by all members of this family, and that the gleba is composed of hymenial cavities elongated at the base where they are decurrent and project below the peridium, their apertures being open to the air.

G. H. Cunningham (Gastero. 1944 : 77) suggests that *Macowanites* may be based on a species of *Hydnangium* and in view of the fact that in two of the four slices of specimens available for study there is an indication of a fine, branched columella, this suggestion should be kept in mind. In the meantime it is impossible to come to any decision in the matter.

Macowanites agaricinus Kalchbrenner. [Plate IV, fig. 1.]

Hedwigia 15 (1876) 115, fig. c.

Kalchbrenner, Grevillea 10 (1882) 107 ; de Toni, Sacc. Syll. Fung. 7 (1888) 179 ; Lloyd, Myc. Writ. 7 (1923) 1198 ; Zeller & Dodge, Ann. Mo. Bot. Gard. 6 (1919) 58, 23 (1936) 636 ; Verwoerd, S. Afr. Journ. Sci. 22 (1925) 166.

Macowaniana agaricinus Kalchbr., Gard. Chron. N.S. 5 (1876) 785.

Plants hemispherical, 3·8 cm. wide, 3·5 cm. high, stipitate, fleshy, becoming wrinkled, dingy brown (Snuff Brown). *Peridium* 1-layered, thin, 1 mm. or less thick. *Stipe* about 1 cm. thick, 1·5 cm. long up to the base of the gleba, "white with cut surface, Cartridge-Buff or a little darker below", prolonged through the gleba up to the apex as a columella. *Gleba* tawny (between Tawny and Russet) arising from the columella as well as from the peridium, compact, composed of unequal, subglobose to elongated cavities formed by anastomosing tramal plates, more or less radiating from the columella, the basal cavities larger, more elongated, decurrent, open to the outside, projecting below the margin of the peridium. *Tramal Plates* 17-34 μ diam., strand-like, without evident palisade hymenial layer. *Basidia* 1-2-spored, apparently soon shrivelling up, the sterigmata finally thread-like structures. *Spores* large, globose, pale olivaceous to olivaceous brown, grossly echinulate, 15·3-18·7 μ diam., average size 17 μ .

Habitat : amongst grass at foot of trees.

Distribution : South Africa, rare.

Specimens examined : at foot of Acacia tree, Somerset East, 1876, *MacOwan 1211* (S.A.M. 35048) 22087.

Specimens not seen : *MacOwan 1211* at Kew, Upsala and a fragment of the Kew specimen in New York Bot. Gard. Herb.

The species is represented by about six slices of the type specimen—three in the South African Museum, one in the National Herbarium, Pretoria, one at Kew, one at Upsala and a corner of the Kew specimen in the New York Botanic Gardens Herbarium. Two water colour sketches at Kew, reproduced in Gardener's Chronicle N.S. 5 (1876) 785, fig. 141, under the original name of *Macowaniana agaricina* are the only known illustrations of the fungus. The above description was made partly from the four slices in South African herbaria and partly from Zeller and Dodge's description (l.c.) of the sketches at Kew. None of these slices shows any stipe or exposed glebal cavities as described and illustrated by Kalchbrenner, although one slice shows two basal glebal lobes. Two of the slices are entirely free of columella but the other two show indications of an inconspicuous branched columella. It is doubtful if any one of the slices examined was cut through the centre of the plant. The presence of columella-like tissue in at least two specimens supports Cunningham's suggestion (Gastero. 1944 : 77) that the genus may have been based on a *Hydnangium*. It is not clear, however, how one could reconcile the exposed glebal cavities—if such actually existed—with the latter genus. No 2-spored basidium such as Kalchbrenner illustrated was seen by me. In most cases there appeared to be only one spore, attached by a lax, thread-like sterigma. Occasionally pairs of spores, one on top of another, suggested that they might originate from one basidium, but in such cases the basidium was never actually seen.

Two other species of *Macowanites* have been described—*M. echinosporus* Zeller & Dodge (Ann. Mo. Bot. Gard. 6, 1919 : 57) and *M. magnus* Parks, (Ann. Mo. Bot. Gard. 22, 1935 : 369). Ed. Fischer (Nat. Pflanz. 7a, 1933 : 111) however, considers that the former is more nearly related to '*Arcangeliella*' on account of its lactiferous vessels and non-percurrent columella, and Zeller & Dodge (l.c. 23, 1936 : 638) suggest that the latter may be considered close to the same genus on account of the lactiferous ducts in the sterile tissue. G. H. Cunningham (Gastero. 1944) treats *Arcangeliella* as a synonym of *Hydnangium*, on the grounds that lactiferous ducts, on which the genus was erected, are not consistently present and therefore do not constitute a generic character. In the sense of Cunningham, therefore, *M. echinosporus* and *M. magnus* would probably be considered *Hydnangium*.

POLYPLOCIMUM Berkeley and GYROPHRAGMIUM Montagne.

The systematic position of these two nearly related, or possibly synonymous genera, is not certain and has given rise to much difference of opinion. Berkeley (Hooker's Journ. Bot. 2, 1943 : 202) considered that his genus *Polyplocium* belonged to the Hymenomycetes and was closely related to *Boletus*. Fries (Epicr. 1, 1874 : 241) named two specimens sent to him by Montagne *Montagnites Dunalii* and *M. Candollei* respectively and referred them to the Agaricaceae. Montagne subsequently erected his new genus *Gyrophragmium* on the specimen of *M. Dunalii* on the grounds that it did not belong to the Agaricaceae but to the Gasteromycetes. de Toni (Sacc. Syll. Fung. 7, 1888 : 55) placed both *Polyplocium* and *Gyrophragmium* in the Podaxineae which he included in the Lycoperdaceae. Ed. Fischer (Nat. Pflanz. 1, 1**, 1900 : 203 and 7a, 1933 : 115) included the two genera in Secotiaceae. Finally Lloyd (Myc. Notes 18, 1904 : 195) expressed the opinion that *Gyrophragmium* (with which he included *Polyplocium* as a synonym) was closer to the Agarics than to the Gasteromycetes, adding "it is a connecting link between the two, passing on one hand through *Montagnites* to *Coprinus* and on the other through *Secotium* to the true Gasteromycetes".

Since the balance of opinion appears to favour the inclusion of *Polyplocium* and *Gyrophragmium* in the Gasteromycetes rather than in the Hymenomycetes, it is proposed to include them in the present work. Following Cunningham's division of the orders and families of the Gasteromycetes, they would appear to be most nearly related to members of the Secotiaceae.

It is held by some that *Polyplocium* and *Gyrophragmium* are synonyms. It is impossible to pass an opinion on this point without having seen overseas specimens and the early stages of both forms of plants, but, judging from South African specimens, there seems some justification for keeping the two genera separate and it has therefore been decided to do so. *Polyplocium* has been reserved for the more massive type of plant in which a large, erect, cup-shaped, volva-like structure—originally the base of the peridium—is found on the thickened part of the fusiform stem, i.e. at the base of the columella, and the apex of the stemlike base, and *Gyrophragmium* for the slender type in which a small, dependent, floccose-membranaceous ring-like structure is found at the base of the columella (the origin of which is not clear) and a small volva-like structure at the base of the stem which is not found in *Polyplocium*. In the latter genus on the other hand, evident remains of the original universal volva are present both on the apex of the peridium and on the outside of the cup-shaped volva, which is not the case in *Gyrophragmium*.

Judging from his illustrations (reproduced by Ed. Fischer, Nat. Pflanz. 7a, 1933 : 115) Montagne appears to have included both types of plant in *Gyrophragmium*; Fig. 88a is that regarded as typical *Polyplocium*, while Fig. 88b is typical *Gyrophragmium* without the scaly rings usually found on the lower part of the stem. If the latter are, as held by Lloyd (l.c.) fragments of the original 'volva' then this must be of a very different texture and nature in the two plants.

3. POLYPLOCIMUM Berkeley.

On two Hymenomycetous Fungi in Hooker's London Journal of Botany 2 (1843) 202.

Sacc. Syll. Fung. 7 (1888) 55; Lloyd, Myc. Writ. 1, Myc. Notes 18 (1904) 195;

Ed. Fisch. Nat. Pflanz. 7a (1933) 115; Verwoerd, Ann. Univ. Stell. 3 (1925) 15.

Type species: *Polyplocium inquinans* Berk.

Plants: upper part finally epigeous, stemlike base remaining buried in the substratum; consisting in the mature condition of a shallow, hemispherical pileate peridium supported on a well-developed stemlike base. Peridium 2-layered, originally enclosing the gleba. Exoperidium thick, areolate or consisting of large warts. Endoperidium thick and fleshy, finally thin, membranous and punky. Dehiscence by irregular circumscissile splitting around the apical portion, resulting in an apical pileate structure with vertically suspended tramal plates attached to the under-side and a large, cup-shaped volva-like structure attached to the stem. Stemlike base originally massive and fleshy, becoming much shrunken, punky and fusiform, the upper part prolonged through the centre of the gleba as a columella to the apex where it expands laterally to merge with the peridium. Gleba attached, in mature plants, to the under-side only of the pileate peridium, consisting of numerous, more or less vertically suspended, black, brittle, simple or forked, toothlike tramal plates which project beyond the margin of the peridium and are so tightly compacted as to form a seemingly continuous, fine daedaloid-like surface at the lower extremity. Spores attached to all surfaces of the tramal plates. Basidia probably 4-spored. Spores oval, brown, smooth.

This plant was first collected by Burke and Zeyher on the banks of the Orange River in what was then the Cape Colony; Zeyher sent a single specimen to Berkeley, who in 1843 erected a new genus and species on it—*Polyplocium inquinans*. The plant was not seen again until 1919, nearly eighty years later, when Dr. I. B. Pole Evans found several more specimens on a termite heap at Vryburg, C.P., in an immature condition. During the following three years, four more collections were made, two by the same collector and two by Mr. Gideon Joubert—a farmer-collector of many interesting fungi. No further specimens were found after 1921 until just recently when Mr. J. P. H. Acocks came across two exceptionally fine, mature plants.

Polyplocium inquinans Berkeley. [Plate V, fig. 1; Plate VI, fig. 1, 2; Plate VII; Plate VIII.]

Hooker's London Journal of Botany 2 (1843) 203; Sacc. Syll. Fung. 7 (1888) 145; Lloyd, Myc. Writ. 1, Myc. Notes 7 (1901) 69; Myc. Notes 18 (1904) 195; Fischer, Nat. Pflanz. 70 (1933) 115.

Gyrophragmium inquinans (Berk.) Lloyd, Myc. Writ. 1, Myc. Notes 18 (1904) 197.

Immature plant (Plate VI fig. 1.) : 22 cm. long, 11 cm. wide, a massive, solid, fleshy, dirty white, club-shaped structure, smooth except at the apex where irregularly areolate to sub-warty. The enlarged apical portion contains the gleba, while the basal part constitutes a massive, stemlike base. The centre of the gleba is traversed right up to the apex by a cylindrical columella—the prolongation of the central part of the stemlike base—while the whole head is enveloped by a universal volva formed by the prolongation of the marginal part of the base from the level at which the central part enters the glebal cavity as a columella. *Gleba* consisting of closely compacted, irregular, black tramal plates, arising both from the underside of the apex of the glebal chamber and from the entire length of the columella. In the former case the tramal plates are long and hang vertically almost to the base of the cavity, while in the latter they are shorter and more or less horizontal to oblique towards the apex (described from one specimen).

Mature Plant up to 19 cm. high, 7.5 cm. wide, consisting of a two-layered, hemispherical, pileate peridium supported on a well-developed, fusiform stalk, the lower portion of which remains embedded in the substratum. *Exoperidium* dirty white to greyish brown, areolate or consisting of thick, flattened to pyramidal, persistent or caducous warts—the remains of the volva-like structure originally enveloping the peridium. *Endoperidium* thick at first, finally membranous, punky, splitting circumscissilely around the apical portion (Plate VII) resulting, 'due to the prolongation of the columella, in an apical, pileate, stalked structure and a large, cup-shaped volva-like structure attached to the thickened area at the apex of the stemlike base. *Stem* fusiform, up to 19 cm. long inclusive of the columella, 1.5–3.5 cm. wide at the thickest part, i.e. about two-thirds from the base, dirty white, fibrous, punky in the irregular, attenuated basal portion, sulcate above the volva. *Volva* up to 7 cm. wide at the margin, irregular, large, tough, membranous, brittle, with or without the exoperidial warts on the outside, forming an erect but spreading cup-shaped collar on the swollen part of the stem. *Gleba* consisting of closely packed, sub-cylindrical to narrow tramal plates which hang vertically from the underside of the pileate structure and project up to 1.5 cm. below the margin. The plates which were originally present on the columella apparently separate from the latter and fall away as the plant matures. *Tramal plates* up to 3 cm. long and 5 mm. wide in the young stage, but drying shorter and thinner, black, brittle, very thin, with minute, longitudinally projecting wings of the same texture. The latter fit closely into others of adjacent plates, forming an almost continuous, irregular, gyrose surface at the lower extremity of the plates. Berkeley compared this surface to the porous surface of *Boletus*. At maturity the plates separate from each other and resemble irregularly twisted, crinkled, tooth-like processes. *Basidia* probably 4-spored, apparently soon shrivelling. *Spores* attached to all surfaces of the tramal plates, typically broadly oval, occasionally globose or truncate, smooth, dark brown, sometimes very shortly pedicellate, $5.2\text{--}10.2 \times 5.2\text{--}6.8\ \mu$, common size $8.5 \times 6\ \mu$.

Habitat : on termite heaps.

Distribution : North and South Africa; North America.

Specimens examined : Armoedsvlakte, Vryburg, C.P., March 1919, *I. B. Pole Evans*, 11856; Malcomess, Knapdaar, nr. Burghersdorp, March 1921, *Gideon Joubert*, 14505, Nov. 1936, 28739 Lake Chrissie, Tvl., March, 1921, *I. B. Pole Evans*, 18115, on termite heaps with *Podaxis pistillaris*.

Specimens not seen : On banks of Orange River, *Burke and Zeyher*, type, South Africa, without locality Kew.

The distinguishing features of this species are the pileate peridium with its closely compacted, black tramal plates vertically suspended from the underside, the large volva-like structure left on the enlarged portion of the fusiform stem at the base of the 'columella' after the endoperidium has dehisced around the apical portion and the oval spores. It differs from *Gyrophragmium Delilei*, as here interpreted, in the more massive stature, the large volva-like structure situated at the apex of the stemlike base and the shape of the spores.

Although the type specimen has not been available for examination, there seems little doubt that the plant dealt with above is the same as that described and illustrated by Berkeley (l.c.) as *Polyplocium inquinans* from Zeyher's South African specimen, since, with the exception of the capillitium threads, which were not found in the above collections and which Berkeley possibly confused with fragments of the tramal plates, the plants seem identical in every respect.

4. GYROPHRAGMIUM Montagne.

Annales des Sciences naturelles, 2 Sér. Bot. 20 (1843) 77.

Ed. Fischer, Nat. Pflanz. 1, 1** (1900) 203, 7a (1933) 115.

Type Species: *Gyrophragmium Delilei* Mont.

Plants: upper part finally epigeous, lower portion of stem remaining submerged in the substratum; consisting of a shallow-hemispherical, pileate structure with black, vertically suspended, tooth-like tramal plates attached to the underside, and supported on a well-developed stem. Peridium thin, membranous, probably 2-layered, originally enclosing the gleba, dehiscing circumscissilely at the margin of the 'pileus'. Stalk proportionately long and slender, the upper part originally prolonged as a columella through the centre of the gleba to the apex, where it expands laterally to merge with the endoperidium; the lower two-thirds submerged, usually clothed with successive rows of floccose, scaly rings, the uppermost of which is larger than the others and is dependent against the stem, while the base is surrounded by a small volva-like structure of the same texture and colour. Gleba consisting of closely compacted, brittle, separate, vertically suspended, tooth-like tramal plates attached to the whole underside of the apex of the peridium, except in the immediate vicinity of the central columella. Basidia probably 4-spored. Spores attached to all surfaces of the tramal plates, globose, dark brown, smooth.

Five species have been described for this genus, but according to Ed. Fischer, l.c., probably only the type species is valid. It is represented in the National Herbarium by four collections only, all found in the Griqualand West area, where much of the country is sandy, by Mr. J. P. H. Acocks. Unfortunately only the fully mature plant has been found up to the present time.

Gyrophragmium has sometimes been confused with *Montagnites*. Fries [Epicr. 1 (1874) 241] was the first to make this error, when he called Montagne's subsequently named *Gyrophragmium*, *Montagnites Dunalii*. In that case the two genera were found together and it is interesting to note that in the case of South African collections most of the *M. Candollei* specimens have been found in the same areas as *G. Delilei*. There is a certain superficial resemblance between the two in stature, position, colour and texture of gills and the presence of a small volva at the base of the stem; but they differ mainly in the fact that in *Montagnites* the gills are lamellate and radiate from an expansion of the apex of the stipe, whereas in *Gyrophragmium* the tramal plates are separate and tooth-like, though sometimes seemingly arranged in parallel lines, and are attached to the apex of the peridium from which they hang vertically.

Gyrophragmium Delilei Montagne. [Plate IV, fig. 2; Plate IX.]

Flore d'Algerie 1 (1846-1849) 369, t. 21, f. 2 pro parte.

Lloyd, Myc. Writ. 1, Myc. Notes 7 (1901) 68, Myc. Notes 18 (1904) 196; Ed.

Fischer, Nat. Pflanz. 7a (1933) 115, fig. 88b.

Montagnea Delilei Fries in litt.

Scleroderma texense Berk., N. Am. Fungi in Lond. Journ. Bot. (1845) 308.

Secotium texense Berk. & Curt., N. Am. Fungi in Grev. 2 (1873) 34.

Agaricus ocreatus Delil. inscr. Fr. Epicr. 1 (1874) 241.

Montagnites Dunalii Fr., Epicr. 1 (1874) 241.

Gyrophragmium texense (B. & C.) Mass., Grev. 19 (1890-1891) 96.

G. argentinum Speg., Fung. Arg. novi v. crit. (1899) 185.

Secotium decipiens Peck.

Gyrophragmium decipiens Lloyd, Myc. Writ. 1, Myc. Notes 6 (1901) 62.

Podaxon strobilaceus Copeland, Ann. Myc. 2 (1904) 4.

Mature plant consisting of a small pileate peridium to the underside of which are attached numerous black, tooth-like, vertically suspended tramal plates, supported on a relatively long, slender, well-developed stalk. *Peridium* shallow hemispherical, 3-3.5 cm. wide, 1.5-2 cm. high, pale to dark greyish brown, smooth or transversely wrinkled at the margin, plane or slightly to strongly umbonate, margin even, becoming lacerate. Stipe 10-20 cm. long, 0.7-2.2 cm. wide, the upper portion dirty white to greyish, deeply sulcate, punky, attenuated towards the apex, representing a prolongation of the basal stem which in the early stages traverses the centre of the gleba to the apex as a columella; the lower two-thirds dirty white to cream tinged with yellow ochre, punky, sometimes becoming hollow, striate and fibrillose when dry, smooth or usually clothed with 2-6 successive rows of flattened to spreading, lacerated, floccose, scaly rings, 7 mm. to 2.5 cm. apart, the lowest ring forming a volva-like structure at the base of the stem, while the top ring which is larger, more regular and dependent against the stem, resembles an agaric ring. *Gleba* consisting of closely compacted, separate, sub-cylindrical or more or less flattened, tooth-like tramal plates, attached singly or in small groups, irregularly or in sub-parallel lines, to the underside of the peridium, hanging vertically downwards to the level of, or slightly below the margin. *Tramal plates* 5-6 mm. long, 1-2 mm. wide, brittle, black, straight or, at the margin, curved towards the centre, sometimes forked at the tips, with minute, longitudinal, wing-like expansions of the same texture, closely compacted together as in *Polyphlocium*. *Basidia* probably 4-spored, apparently soon shrivelling up. *Spores* borne on all surfaces of the tramal plates, smooth, brown, typically globose, 5-7 μ diam., sometimes apiculate or very short pedicellate.

Habitat: in sandy places.

Distribution: North and South Africa; North and South America; Asia; Europe.

Specimens examined: in red sand, Kimberley Distr., Griqualand West, March 1936, *J. P. H. Acocks*, 28624; near de Beer's Mine, Kimberley, May 1936, *J. P. H. Acocks* 336, (Kew) 28635; Olifantshoek Rd., Kuruman Distr., C.P., June 1936, *J. P. H. Acocks* 405, 28640, Kew; Knockbarragh, Barkly West, C.P., May 1936, *J. P. H. Acocks* 330, 28634.

Specimens not seen: Brackenfel, Belville, *J. P. H. Acocks*, Kew.

The South African form of this species is recognised by its slender stature, consisting of a small, pileate peridium supported on a long, slender stalk, the presence of the lower two-thirds of the stem of successive, floccose, membranous rings, the lowest of which forms a volva-like structure at the base of the stem, while the top one resembles a dependent ring of an agaric, and the globose spores. Unfortunately no early stage of the plant has

been seen by me and the significance of the small volva-like structure at the base of the stem and the agaric-like ring at the top of the subterranean part is not clear. The size and appearance of the latter suggest that it may have originally been united to the margin of the "pileus", thus forming the lower part of the peridium as in *Polyplodium*. According to Lloyd, the young plants are enclosed in a 'volva' which breaks irregularly as the plant grows, usually remaining as a kind of 'volva-cup' at the base of the plant in the European form and generally breaking loose from the base of the plant in the American form. He considered that the scaly rings on the stem are fragments of the 'volva'.

The European and American species appear to include a wide range of forms from the slender type found in South Africa and the Argentine to the massive type approaching *Polyplodium* found in Europe and America. *Gyrophragmium texense* for instance, has the stature of *Polyplodium* but a stem more like *Gyrophragmium*. *G. decipiens* likewise has the stature of *Polyplodium*, but, according to Lloyd, i.e., the volva does not usually form a cup, but breaks away from the base of the stem. *G. argentinum* appears to be typical of the South African form, but *Podaxon strobilaceus* has characters of both. In this connection, the similarity of Copeland's *Battarea arenicola* [Ann. Myc. 2 (1904) 2, Plate 1, fig. 6] both in description and illustrations, to the slender form of *G. Delilei* is striking.

PHALLALES.

The phalloids are recognised by their bizarre shapes, vivid red and orange colours, brittle, spongy texture, their ephemeral nature and usually overpowering foetid smell. They are world-wide in distribution, appearing overnight, usually after a wet spell, and collapsing after a few hours. The foetid smell serves to attract certain flies which aid in the dissemination of the spores. All forms of this order are characterised by the presence of an egg-like structure called the peridium, which splits at the apex to allow of the development from its centre of a spore-bearing structure known as the receptacle. The remains of the peridium left at the base of the receptacle are called the volva. The detailed characters of the order are as follows:—

Peridium usually of 3 layers (2 in one family), an outer, tough, membranous layer—the exoperidium, a middle gelatinous layer the mesoperidium—and an inner delicate membrane—the endoperidium—which encloses the spore-bearing receptacle. Receptacle loosely pseudo-parenchymatous, turgid and brittle, stipitate or non-stipitate, giving rise to one or more cellular or tubular columns and/or to a hollow, spherical, clathrate or latticed structure. Spore-mass mucilaginous, foetid, olive or brownish green, borne on some portion of the surface of the receptacle. Spores usually small, tinted, smooth and bluntly elliptical. "Basidia 4-8-spored."

Cunningham extends the order to include three families, erecting a special family—Claustulaceae—for the genus *Claustula* on account of its indehiscent receptacle and lack of mucilage. Fischer refers *Claustula* to the Clathraceae.

1. Claustulaceae :

Receptacle an obovate, indehiscent, hollow sphere, the spore mass lining the inner surface of the wall.

2. Phallaceae :

Receptacle a simple, cylindrical, hollow stem, the spore mass borne directly on the apical portion or on a campanulate pileus attached to the apex.

3. Clathraceae :

Receptacle forming a stipitate or sessile structure which is clathrate, columnar or of apically united connivent or free arms arising from the apex of a stemlike base. Spore mass borne on some portion of the receptacle, usually the arms.

Of the above families only the Phallaceae and Clathraceae are represented in Southern Africa, the former by the genera *Mutinus*, *Itajahya*, *Phallus* and *Dictyophora* and the latter by *Linderiella*, *Anthurus*, *Lysurus*, *Clathrus* and *Kalchbrennera*. *Aseroe* and *Colus* have been recorded from this country but their occurrence seems doubtful.

As far as our records show *Mutinus* and *Anthurus* are confined to the south-western Cape, *Itajahya* to the Transvaal and Orange Free State and *Linderiella* to Angola. The remaining species appear to be fairly evenly distributed.

Our knowledge of the South African phalloids and their distribution is very imperfect and it is quite possible that unrecorded species still exist. Apart from the coastal belt of the Cape Province with its temperate climate and winter rainfall, where these plants occur fairly regularly every winter, very little systematic collecting of phalloids has been done in any part of the country. Various native and other forest areas in subtropical parts with summer rainfall remain quite unexplored and should yield a rich harvest of such plants. Unfortunately such likely areas are off the beaten track and distances being very great, transport problems are often unsurmountable. Added to these difficulties is the brittle and ephemeral nature of the plants themselves which discourages private individuals from sending such specimens by post.

PHALLACEAE Corda.

Icones Fungorum 5 (1842) 29 ;

emend. Ed. Fischer, Natürlichen Pflanzenfamilien 1 (1900) 289.

Peridium globose, oval or ovate, consisting of three layers of which the middle one is finally gelatinous ; splitting at the apex into irregular lobes on the expansion of the receptacle, at the base of which it remains collapsed as a volva. Receptacle hollow, cylindrical or fusiform, the wall consisting of one or several layers of cells. Spore mass borne externally on the modified apex of the stem or on a campanulate pileus attached to the apex ; olive green or brownish olive green. Indusium present in one genus *Dictyophora*. Spores elliptical, smooth, hyaline or tinted.

Key to the Genera (sec. Cunningham).

Spore mass borne directly on the upper part of the receptacle.

Spore mass covering the apical portion of the receptacle..... 1. **Mutinus**.

Spore mass forming a collar-like restriction below the inflated apex of the receptacle..... (*Staheliomyces*).

Spore mass covering a net-like pileus loosely attached to the upper part of the receptacle..... (*Floccomyces*).

Spore mass borne on a campanulate pileus.

Indusium absent or only rudimentary.

Pileus formed of radiate plates..... (*Aporophallus*).

Pileus formed of lamellate plates..... 2. **Itajahya**.

Pileus externally rugulose, papillate or reticulate..... 3. **Phallus**.

Indusium present, well developed..... 4. **Dictyophora**.

Of the seven genera included in the above key, four only occur in South Africa—*Mutinus*, *Itajahya*, *Phallus* and *Dictyophora*. Of the remainder, *Staheliomyces* occurs in British Guiana and the Malay Archipelago, *Floccomyces* in West Africa and *Aporophallus* in Brazil.

1. **MUTINUS** Fries.

Summa Vegetabilium Scandinaviae, Part 2 (1849) 434.

Phallus § *Cyanophallus* Fr., *Syst. Myc.* 2 (1822) 284.

Cyanophallus (Fr.) Corda, *Icon. Fung.* 6 (1854) 19.

Corynites Berk. et Curt., *Trans. Linn. Soc.* 21 (1855) 149.

Jansia Penz., *Ann. Jard. Bot. Buitenzorg* 16 (1899) 139.

Type Species : *Mutinus caninus* (Huds. ex Pers.) Fr.

Peridium spherical or oval, splitting at the apex into two or three lobes, finally collapsing against the base of the expanding receptacle. *Receptacle* simple, hollow, cylindrical or fusoid, perforated or not at the tip, cellular, usually some shade of red or pink, bearing the olive-green mucilaginous spore mass at or near the apical portion of the receptacle, which may be rough or smooth due to the presence of pulvinate or pseudo-parenchymatous processes. *Spores* cylindrical, smooth and tinted.

This genus is the most primitive of the family since the receptacle consists of a simple, hollow stalk which bears the spore mass directly on its apical portion.

Distribution : Europe ; Asia ; North and South America ; Africa ; India ; Ceylon.

Following Cunningham, the species are divided on the nature of the spore-bearing part.

I. Spore-bearing part smooth or rugulose.

(*M. caninus*, *M. curtus*, *M. Curtisii*, *M. Fleicheri*, *M. xylogenus*.)

II. Spore-bearing part covered with irregular pseudoparenchymatous processes.

(*M. bambusinus*, *M. borensis*.)

III. Spore-bearing part covered with digitate processes.

(*M. Pentzigii*, *M. proximus*.)

Of the 19 species described, Cunningham considers that only the above 9 are good species. To these *M. simplex* Lloyd, found in the forest area of Knysna, South Africa, might possibly be added. An examination of fresh plants is necessary to determine if this species can be separated from *M. Curtisii* (*M. elegans*). Of the species mentioned above, *M. Curtisii* is probably found in South Africa but the occurrence of *M. bambusinus* is extremely doubtful. Descriptions of all three species are however given to cover any uncertainty.

Key to the Species.

Spore-bearing part of receptacle smooth or rugulose.

Spore-bearing part not obviously differentiated from the rest of the stalk.

Receptacle tapering to a blunt point..... **M. Curtisii.**

Spore-bearing part more or less transversely rugulose. Receptacle more or less equal, terminating in a blunt point.....

M. simplex.

Spore-bearing part sharply differentiated from the stalk. Receptacle terminating in a sterile tip.....

M. bambusinus.

1. **Mutinus Curtisii** (Berk.) Ed. Fischer. [Plate X, fig. 1.]

Versuch einer systematischen Übersicht über die bisher bekannten Phalloideen (Jahrb. d. Königl. bot. Gartens zu Berlin IV, 1886 : p.l.).

Corynites Curtisii Berk., *Grev.* 2 (1873) 34.

Mutinus bovinus Morgan, *Journ. Cinn. Soc. Nat. Hist.* 12 (1889) 147.

M. elegans (Mont.) Ed. Fischer.

Peridium 3×1.5 cm., spherical then oval, white, splitting at the apex into several irregular lobes and finally collapsing against the developing receptacle; rooting by a strong, white, cord-like mycelium. *Receptacle* up to 8.5 cm. long, 1.9 cm. diam. at thickest part, tapering gradually to a blunt point; whitish in pickled specimens, probably some shade of red or pink in fresh plants; hollow, not perforate at the apex, slightly tubercular, more or less uniform, cellular, wall 1–2 chambered, cells opening inwards except at base where some are perforate on the outside; *spore-bearing* portion not obviously differentiated from the rest of the receptacle, apical, 4.5–5 cm. long, covered with olive-green slime. *Spores* about $3.4 \times 2 \mu$ diam., tinted, oblong-cylindrical.

Habitat: on the ground.

Distribution: North America; Europe; South Africa.

Specimens examined: Rondebosch, C.P., June 1930, *E. Loseby*, 25461. These specimens, preserved in formalin with no notes attached, were probably identified by C. G. Lloyd, since all unknown specimens collected by the late Miss Loseby were, I think, sent to Lloyd for naming.

Specimens not seen: Rondebosch, June 1932, *J. Acocks* (E.L.S. 127) "with red tube".

It has been suggested (Fischer in *Nat. Pflanz.*, 1933) that *M. simplex* probably takes the place of *M. Curtisii* in South Africa, but the specimens described above appear to be (as far as one can tell without examining fresh plants) *M. Curtisii* and not *M. simplex*.

This species is recognised by the shape of its receptacle which gradually tapers to a blunt point.

2. *Mutinus simplex* Lloyd.

Mycological Writings 6 (1919) 879, Fig. 1504.

Peridium 2.2×2 cm., oval, whitish, splitting at apex into several segments; attached to soil by a stout, white, cord-like mycelium. *Receptacle* 7 cm. long, 1.9 cm. diam., bright red above, yellowish red towards base, rugulose, hollow, cellular, cells uniform, perforate towards inside, but continuous on outside; more or less equal, terminating in a blunt point. *Spore-bearing* part 2 cm. long, apical, more or less transversely rugulose (in dried specimens), covered with brownish-green slime. *Spores* $4.5 \times 1.5 \mu$ diam., tinted, cylindrical, smooth.

Habitat: in indigenous bush.

Distribution: South Africa.

Specimens examined: Brenton, Knysna, *A. V. Duthie* 215, 31403; 31510 (E.L.S. 32) det. Lloyd.

Specimens not seen: Lloyd, Mycological collections No. 57856, Type, and 57850. It is not known to which of Dr. Duthie's collections these numbers refer.

Only two dried specimens were available for examination, one, *Duthie* 215, accompanied by a note that it was much shrunken and that the colour of the stalk was bright red, and the other, accompanied by a coloured outline sketch. The latter does not, however, show a transversely rugulose spore-bearing portion, so shrinkage may have been responsible for this appearance in the dried specimen. The measurements given were taken from the sketch.

According to Lloyd, this species is characterized by the lack of any differentiation between the spore-bearing portion and the rest of the receptacle, the uniform size of the cells of the latter, and the fact that these are continuous on the outside and perforate on the inside. *M. simplex* is said by Lloyd to differ from *M. elegans* (c.f. *M. Curtisii*) mainly in the shape of the receptacle.

3. *Mutinus bambusinus* (Zoll.) Ed. Fischer. [Plate X, fig. 2.]

Annales du Jardin Botanique de Buitenzorg 6 (1886) 30, tab. 4-5 fig.

Petch, Trans. Brit. Myc. Soc. 10 (1926) 272; Sacc. Syll. Fung. 7 (1888) 12.

Phallus (*Cyanophallus*) *bambusinus* Zoll., Syst. Verzeich. Indisch. Arch. 1842-48 gesammel (1854-1855).

Peridium 3.5×2 cm. diam., oval, sometimes covered above with a grey tomentose layer which splits into patches with growth of egg. *Receptacle* fusoid, up to 16 cm. high, 1.2 cm. diam., attached by a white, cord-like mycelium, purplish or red at apex, paler below, hollow, cellular, wall composed of single layer of large chambers the exterior walls of which are frequently perforate, the interior continuous. *Spore-bearing* part apical, except for 5 mm. of the tip which is sterile, pinkish, perforated or not and of the same structure as the stalk; variable in length, usually about half the total length, elongated conical, sharply differentiated from the stalk; diameter of head at junction with stalk up to 2 mm. greater than that of latter; dark red, dirty purple or brownish red with spore mass, bright crimson without; surface almost smooth to rough or granular due to the presence of irregular parenchymatous processes; spore mass dark olive, spread out in a thin patchy film when plant is fully developed. *Spores* cylindrical or oblong oval, $2-4 \times 1 \mu$. Odour strong, not unpleasant.

Habitat: usually in decaying debris.

Distribution: mainly Java and Ceylon; possibly Brazil and South Africa.

Specimens examined: Brenton, Knysna, March 1921, *A. V. Duthie* 291, 31461 (identified by C. G. Lloyd); Belvidere, Knysna, *Duthie*, 31504.

Specimens not seen: Brandfort, *Schonken* (*Duthie* 295).

Duthie 291 is probably not *M. bambusinus*, but it is impossible to be sure of the characters since the whole spore-bearing part is lacking. The wall cells are continuous on the outside instead of perforate, which suggests *M. simplex* or possibly *M. Curtisii*. The second specimen, 31504, may possibly be *M. bambusinus*, since the wall cells are perforate on the outside and the spore-bearing part (very shrunken) appears to be thicker than the stipe and differentiated from it. In this case too, the specimen is in fragments and it is impossible to make out anything from the scraps of material. The species is only included in case it does occur in South Africa, which seems doubtful.

2. *ITAJAHYA* Alfr. Möller.

Brasilische Pilzblumen in Botan. Mittheil. a.d. Tropen von A. F. W. Schimper, Heft VII, 1895, p. 79.

Alboffiella Spegazzini in Anales del Museo nacional de Buenos Aires, 6, 1899: 183.

Type Species: *Itajahya galericulata* Möller.

This genus resembles *Phallus* in general appearance, but differs in the structure of the pileus which is furnished with lamellate plates, on and between the branches of which the spore mass is borne.

Itajahya galericulata is the only well-established species known. Fischer (Nat. Pflanzenfam. 1933: 102) suggests that *Phallus roseus* Delile may possibly be the same plant.

1. *Itajahya galericulata* Möller. [Plate XI; XII; XIII; XIV; XV; XVI.]

Brasilische Pilzblumen (1895) 79, tab. 5.

Ed. Fischer, Nat. Pflanzenfam. (1933) 101; Sacc. Syll. Fung. 11 (1895) 153; Long & Stouffer, Gertero. IX in Mycologia 35 (1943) 620.

? *Alboffiella argentina* Speg., Anales del Museo nacional da Buenos Aires 6 (1899) 183.

Peridium 4-8 cm. diam., subglobose, oval or obovate, compressed by mutual pressure when caespitose, white, splitting into several irregular lobes at the apex; attached by a strong, white mycelial cord. *Receptacle* 8-16 \times 1.5-4.0 cm., white, cylindrical, tapering at both ends or only towards the base, straight or curved, spongy, hollow, taut, brittle, cellular, wall 3-4-layered, cells finally perforate externally, depressed and usually continuous internally; outer surface originally covered by a thin, white, floccose mycelial layer, which disappears with development, exposing the open cells. Apex at first covered by a semi-transparent membrane, finally perforate or not. *Pileus* 2-4 cm. high, 2-6 cm. broad, campanulate-cylindrical, white, sub-membranous, upper edge attached to the underside of a smooth, white, solid, centrally-depressed cap with irregular margin formed by the recurved expansion of the wall at the apex of the stem; externally shallowly reticulated, the walls of the reticulations giving rise to dichotomously branched, pseudoparenchymatous, white, lamellate expansions which terminate in minute cauliflower-like processes on and between which the spore mass is born. These white, branched tips permeate the dark spore mass and are apparent on the outer surface, giving the latter a mottled appearance. A second white cap (calyptra) —possibly the remains of a volva—may be present on top of the stem cap. (Plate XV fig. 2.). *Spore mass* at first dark grey, finally greenish black, mucilaginous. *Spores* hyaline, smooth, broadly elliptic, about $4 \times 2 \mu$ diam. *Smell* strong, foetid.

Habitat: single, in groups or caespitose, in gardens, under hedges and in open clayey ground, occurring in summer during wet spells.

Distribution: South and North America; South Africa; possibly Egypt and Palestine

Specimens examined: Pretoria, Jan. 1915, *E. M. Doidge*, 18072; Pretoria, *A. M. Bottomley*, April 1920, 13069, Jan. 1920, 14238, Feb. 1943, 33771, Feb. 1944, 34919; Pretoria, *P. H. B. Talbot*, March 1945, 34147. •

As indicated above, this interesting but little known plant was found in South Africa as early as 1915 but was recorded as *Phallus impudicus*; it was only a few years ago, when going through the collections, that its true identity was discovered. It is distinguished from the Phallaceae by the structure of the pileus which gives rise to a number of lamellate plates, the branched tips of which traverse the gleba and give the pileus a mottled appearance.

The South African plant seems to agree more with the Brazilian form than with the North American (Long & Stouffer, l.c.) in that no membranous veil has so far been seen and a volva cap is not consistently present.

3. **PHALLUS** Linnaeus ex Persoon.

Synopsis Methodica Fungorum (1801) 242.

emend. Fries, Summa Veget. Scandinaviae (1849) 434.

Hymenophallus Nees, Syst. Pilze und Schwämme (1817) 251.

Phallus § *Ithyphallus* Fr., Syst. Myc. 2 (1822) 283.

Phallus § *Leiophallus* Fr., l.c., p. 294.

Dictyophallus Corda, Anl. Stud. Mycol. (1842) 190.

Kirchbaumia Schulzer, Verh. zool.-bot. Gesellsch., Wien, 16 (1866) 798.

Omphallophallus Kalchbr., Flora 46 (1883) 95.

Ithyphallus (Fr.) Ed. Fisch., Jahrb. bot. Gart. Berlin, 4 (1886) 41.

Cryptophallus Peck, Bull. Torrey Bot. Club, 24 (1897) 147.

Echinophallus P. Henn., Engl. bot. Jahrb. 25 (1898) 505, pro parte.

Type Species: *Phallus impudicus* L. ex Pers.

Peridium globose, oval or ovate, splitting irregularly at the apex into several lobes. Receptacle simple, hollow, cellular, cylindrical or fusiform, bearing at its apex a campanulate pileus which may be smooth, rugulose or reticulate. Spore-bearing mass mucilaginous, olive-green, spread over the outside of the pileus. Indusium absent, but an evanescent veil may be present between the pileus and the stem and at the base of the stalk. Spores cylindrical, tinted, smooth. Odour usually foetid.

The presence of a pileus, which bears the spore mass, separates this genus from *Mutinus*, in which the spore mass is borne on the receptacle itself.

Habitat : on the ground, single, caespitose or in groups.

Distribution : Africa ; North and South America ; Australia ; Ceylon ; India ; East and West Indies ; Japan ; Tasmania.

Of the 26 species recorded for this genus, Cunningham considers that only about 7 are good species. These are grouped in two sections according to the external appearance of the pileus :

1. Reticulati : Pileus with raised reticulations.
(*P. costatus*, *P. impudicus*, *P. tenuis*, *P. favosus*.)
2. Rugulosi : Pileus smooth or finely rugulose.
(*P. glutinolens*, *P. Ravenelii*, *P. rubicundus*.)

Of the above species, one only occurs with certainty in South Africa, viz. *Phallus rubicundus*. *P. impudicus* may or may not occur.

1. *Phallus impudicus* Linn. ex Pers. [Plate XVII.]

Commentarius Dr. Jacobi Schaefferi fung. Palat. et Bav. (1800) 80.

Hollós, Gastero. Ungar. (1904) 27 ; Lloyd, Myc. Writ. 2 (1907) ; Myc. Notes p. 327 ; Coker & Couch, Gastero. (1928) 12 ; Ed. Fischer, Nat. Pflanzenfam. (1933) 103 ; Sacc. Syll. Fung. 7 (1888) 8.

Ithyphallus impudicus (Linn.) Ed. Fischer, Versuch. syst. Phall. (1886) 43.

Phallus Hollandicus vel *Batavicus* Lugd., Hist. 1398 (1586).

P. (impudicus) volvatus Linn., Spec. plant. 2 (1648).

Fungus Phalloides Bauhin, Hist. Plant. (1651) 843.

Boletus phalloides Tournef., Inst. rei herb. 1 (1719) 562.

Phallus vulgaris Micheli, Nova Plant. gen. (1729) 201.

P. volvatus Rothm., Vetensk. Acad. Handling (1742) 201.

Phallogastrum Bononiense alpinum Bussii Battarra, Fung. Armin. agri. hist. Ed. II (1759) 75.

Phallus roseus Delile, Descript. de l'Egypte Hist. nat. 2 (1813) 300.

Hymenophallus Hadriani Nees, Syst. Pilze u. Schwämme (1817).

Phallus iosmos Berk., in Sir. J. E. Smith Eng. Flora, Crypt. 5 (1836) 227.

Phallus foetidus Sowerby, Engl. Fungi, tab. 329.

P. imperialis Schulzer in Kalchbr. Icon. Selecti Hym. Hung. (1877) 63.

Peridium up to 5 cm. diam., globose or egg-shaped, white, sometimes pink or lilac, splitting apically into 2-3 lobes, attached by a stout, white, sometimes pale yellow or pinkish, mycelial cord. *Receptacle* 5-25 cm. high, typically white, sometimes pale yellow or pink, cylindrical, tapering at the base, cellular, perforated or not at the apex. A rudimentary

veil may be present between the receptacle and the pileus and at the base of the receptacle inside the volva. *Pileus* 4·5–5 cm. long, campanulate, adnate to the receptacle and apically attached to a broad white expansion of the stem apex, externally deeply reticulated with large chambers, reticulations up to 5 mm. deep; internally and at the apex, smooth, greyish-white, grey or brownish, covered by the dark green, mucilaginous spore mass. *Spores* cylindrical, rounded at the ends or elliptic, occasionally pear-shaped, $2\cdot5\text{--}5\cdot5 \times 1\cdot3\text{--}2\cdot5 \mu$, smooth, tinted yellowish.

No specimens of *P. impudicus* have been seen by me and judging from its known geographical distribution, it seems a bit doubtful if the species occurs in South Africa. The above description has been adapted from that of Hollós (l.c.), Lloyd (l.c.) and Coker and Couch (l.c.) to cover all forms.

Habitat: on ground in woods, sandy places and on dead wood.

Distribution: Europe; Asia; North America, where the pink form known as *P. imperialis* occurs; South America; Java; Ceylon; Japan; ? South Africa.

South African Records: Salisbury, S. Rhodesia, Jan. 1925, *C. H. Green* (Eyles 4140, v. d. Byl 2345); Feb. 1928, *J. C. Hopkins* (S. Rh. 377, v. d. Byl 2500); Stellenbosch, May 1926, *P. van der Byl* 2333.

These specimens were examined by me at Stellenbosch and considered to be probably *P. rubicundus*, not *P. impudicus*.

2. *Phallus rubicundus* (Bosc.) Fries. [Plate XVIII.]

Systema Mycologicum 2 (1822) 284.

Satyrum rubicundus Bosc., *Mag. Ges. nat. Freunde* 5 (1811) 86.

Phallus canariensis Mont., *Phyto. Canariensis* (1840) 84.

P. aurantiacus Mont., *Ann. Sci. Nat. Ser. II*, 16 (1841) 277.

P. novae-hollandiae Corda, *Icon. Fung.* 6 (1854) 19.

P. vitellinus F. v. Muell., *Frag. Phyto. Aus.*, 7 (1868) 122.

P. truncatus Berk., *Intell. Obs.* 12 (1869) 18.

P. aurantiacus var. *discolor* Kalchbr. ex Cooke, *Grev.* 9 (1880) 2.

Cynophallus Cayleyi Berk. ex F. v. Muell., *Frag. Phyto* 11 (1880) 119.

Omphallophallus Muellerianus Kalchbr., *Flora* 46 (1883) 95.

Phallus libidinosus Cayley ex Cooke, *Grev.* 11 (1882) 58.

Omphallophallus retusus Kalchbr., *Ungar. Akad. Wiss.* 13 (1884) 6.

Ithyphallus retusus (Kalchbr.) Ed. Fisch., *Jahrb. bot. Gart. Mus. Berlin*, 4 (1886) 49.

I. rubicundus (Bosc.) Ed. Fisch., l.c., p. 50.

I. aurantiacus (Mont.) Ed. Fisch., l.c., p. 51.

I. rugulosus Ed. Fisch., *Ann. Jard. Bot. Buitenzorg* 6 (1887) 35.

I. balansiae Pat., *Journ. de Bot.* (1890) 55.

Ithyphallus Muellerianus (Kalchbr.) Ed. Fisch., *Denkschr. Schw. nat. Gesellsch.*, 33 (1893) 34.

Phallus celebicus P. Henn., *Monsunia* 1 (1900) 21.

Ithyphallus celebicus (P. Henn.) Ed. Fisch., *Denkschr. Schweiz. nat. Gesellsch.*, 36 (1900) 53.

- Phallus sanguineus* P. Henn., Engl. bot. Jarhb. 30 (1901) 57.
Ithyphallus coralloides Cobb. Agr. Exp. Sta. Hawaii, Bull. 5 (1906) 208.
Phallus discolor (Kalchbr.) Lloyd, Myc. Writ. 2, Phall. Aus. (1907) 10.
P. gracilis (Fisch.) Lloyd, Myc. Writ. 3, Syn. Phall. (1909) 14.
Ithyphallus discolor (Kalchbr.) Sacc. et Trav., Sacc. Syll. Fung. 19 (1910) 987.
I. atrominiatus Bailey, Comp. Cat. Queensland Plants (1910) 746.
I. operculatus Bailey, l.c.
Kupsura sphaerocephala Lloyd, Myc. Writ. 7 (1924) 1303; Verwoerd, S. Afric. Journ. Sci. 25 (1928) 225.

Peridium 1.5 3 × 1.1-1.5 cm., white, globose, then oval or ovate, splitting irregularly at apex into several lobes, attached by a white, branched, cord-like mycelium. *Receptacle* 6-15 cm. × 0.8-1.5 cm., golden yellow, buff, salmon-orange, apricot orange (Light Salmon Orange, Apricot Orange) usually paler towards base, cylindrical or tapering towards base and very slightly towards apex; slightly rugose, hollow, cellular, the wall composed of one to several layers of cells, the majority of the latter opening on the outside, but some towards the inside, perforate or depressed in centre of apex. *Pileus* 1.6 2.8 × 0.9-1.3 cm., thimble-shaped or conical, closely adnate to the receptacle; externally finely to coarsely rugulose, sometimes resembling irregular longitudinal ribs; paler in colour than receptacle, covered by brownish-olivaceous mucilaginous spore mass, attached to apex of stipe by a narrow, white, smooth disc; lower margin even to irregular; the apex often bears the remnants of the volva in the form of a white membranous cap over the disc. *Spores* 4-5 × 2-3 μ , broadly oval, smooth, tinted. *Odour* strong, very foetid.

Habitat: singly or in groups on the ground, chiefly in grassy places, also on cinder embankments.

Distribution: Africa; North America; Australia; Hawaii; East Indies; West Indies; India; Tasmania.

Specimens examined: Pretoria, *A. M. Bottomley*, Jan. 1920, 12516, det. Ed. Fischer; Jan. 1921, 14237; April 1925, 20369; Feb. 1920, 12809; Feb. 1928, on cinder embankment, 23156; Pretoria, *D. Fouche*, 14643; Feb. 1923, *S. Kraan*, 17001; Feb. 1915, *I. B. Pole Evans*, 9041, 18079; Wonderboom, Pretoria, March 1917, *H. A. V. King*, 10047; Meyerton, Tvl., *Vorster*, 20373; Rustenburg, Feb. 1934, *E. du Toit*, 27363; in mealie lands, Maritzburg, Feb. 1918, *T. R. Sim*, 11322; Johannesburg, Jan. 1918, *J. Burt Dary*, 11011; Brenton, Knysna, *A. V. Duthie* 216, (E.L.S. 56, 413 as *P. rugulosus* Fisch.; Lloyd Myc. Coll. 57821) 31404; Orange Free State, *Miss Olivier*, Jan. 1937 (E.L.S. 490) 34495; see also sub *P. impudicus*.

Specimens not seen: Without locality, *Medley Wood* 699, Kew and Berlin (det. Ed. Fischer as *P. aurantiacus* f. *gracilis*, Untersuch. 1893 : 37); Knysna, *Duthie* 208, as *P. gracilis* Fisch. (Lloyd Myc. Coll. 50084); Brandfort, O.F.S., *Schonken* (Duthie 299); without locality, *Duthie* (Lloyd Myc. Coll. 24893); Sydenham, Natal, *Holwell*, Kew; ? Boschberg, nr. Somerset East, *Tuck & MacOwan* (MacOwan 1225, 1286 as *P. campanulatus*); Knysna, 1924, *A. V. Duthie*—egg stage named by Lloyd *Kupsura sphaerocephala* (Myc. Writ. 1924 : 1303); later specimens of the latter from the same place were developed by Verwoerd (S. Afric. Journ. Sci. 25, 1928) and determined as *Phallus rugulosus*; Rondebosch, C.P., Dec. 1939, *Mrs. Crawford* (E.L.S. 555, 556).

T. R. Sim 11322.—Dr. Sim supplies the following information in connection with this specimen:—"Known to the natives as 'i-sona' and said by them to destroy the mealie plant wherever it grows." There is no confirmation of this. Cobb recorded this species as parasitising sugar cane in Hawaii.

A. V. Duthie 216.—Dr. Duthie included a coloured sketch with this specimen illustrating the development of the plant from the spherical egg stage to the expanded plant. The receptacle is 9×1 cm., the stalk and apical disc yellow, and the eggs, volva and rooting mycelial cord pale rose pink. Fresh specimens are necessary to confirm the identification of this plant.

This species is recognised by its usually finely rugulose pileus and its buff, orange or red stalk. It is the commonest species in the summer rainfall areas, occurring plentifully in wet seasons from January to April. It collapses after a few hours. The plant shows considerable variation in size, shape and colour. There seem to be two distinct forms—a tall, slender plant with acuminate stalk and slightly protruding disc and a shorter, more robust form with thimble-shaped pileus and flattened apex.

Excluded species.

Phallus campanulatus Berk.

Ann. & Mag. Nat. Hist. 9 (1842) 446; Grev. 10 (1880) 106.

Ithyphallus campanulatus (Berk.) Schlecht. in Sacc. Syll. Fung. 7 (1888) 11.

South African Record: Boschberg, nr. Somerset East, Tuck & Macowan (MacOwan 1225, 1286). Fischer in Sacc. Syll. Fung. l.c., queries whether these specimens are *P. campanulatus* and suggests that they resemble *P. rugulosus*, in which case they should be included in *P. rubicundus*. Berkeley l.c., makes the observation that these specimens differ from *P. impudicus*, not yet found in Africa, in the globose instead of oval egg and the broadly campanulate pileus, which is rugose rather than reticulated. He does not mention the colour of the stipe, which in *P. campanulatus* is described as dirty white.

4. DICTYOPHORA Desvaux.

Journal de Botanique, 2 (1809) 88.

Hymenophallus Nees, Syst. Pilze u. Schwämme (1817) 251.

Phallus § *Hymenophallus* Fr., Syst. Myc. 2 (1822) 282.

Sophronia Pers., in Gaud. Voyage aut. Monde (1836) 178.

Retigerus Raddi, Mem. Soc. Ital. Moden., 20 (1829) 46.

Dictyophora § *Clautriaria* Fat., Bull. Soc. Myc. France 14 (1898) 190.

Clautriaria (Pat.) Lloyd, Myc. Writ. 3, Syn. Phall. (1909) 24.

Type Species: *Dictyophora indusiata* (Vent. ex Pers.) Desv.

This genus is the same as *Phallus*, except that it has an indusium—a pseudoparenchymatous, netlike structure, which is attached under the pileus to the apex of the stem and hangs down around the latter for a considerable distance below the pileus. *Dictyophora indusiata* (Vent. ex Pers.) Desv. is the only species so far known in South Africa.

1. Dictyophora indusiata (Ventenat ex Persoon) Desvaux. [Plate XIX.]

Journal de Botanique 2 (1809) 192.

Phallus indusiatus Vent. ex Pers., Syn. Meth. Fung. (1801) 244; Lloyd, Myc. Writ. 2 (1907) 332.

Dictyophora phalloidea Desv., Journ. de Bot. 2 (1809) 92.

D. campanulata Nees, in Lév., Mem. Soc. Linn. Paris 5 (1827) 499.

Phallus § *Hymenophallus subiculatus* Mont., Ann. Sci. Nat. Ser. II, 18 (1842) 244.

Dictyophora bicampanulata Mont., Ann. Sci. Nat. Ser. III, 10 (1848) 120.

- D. radicata* Mont., Ann. Sci. Nat., Ser. III, 3 (1855) 137.
Phallus tunicatus Schlecht., Linnaea 31 (1861) 123; Welwitsch & Currey, Trans. Linn. Soc. 26 (1870) 286.
P. brasiliensis Schlecht., l.c. p. 124.
P. tahitiensis Schlecht., l.c., p. 126.
Dictyophora nana Berk. ex Cooke, Grev. 11 (1882) 59.
Phallus collaris Cragin, Bull. Washborn Coll., 1 (1885) 33.
P. diplopore Mont. ex Ed. Fisch., Denkschr. Schweiz nat. Gesell. 32 (1890) 81.
Dictyophora Farlowii Ed. Fisch., l.c. p. 83.
D. callichroa Moell., Braz. Pilz. (1899) 129.
D. lilloi Speg., Anal. Mus. Nac. Beunos Aires 16 (1906) 30.
Phallus callichrous (Moell.) Lloyd, Myc. Writ. 2, Phall. Aus. (1907) 6.
P. rochesterensis Lloyd, Myc. Writ. 3, Syn. Phall. (1909) 20.
P. Moelleri Lloyd, l.c.
Dictyophora Baileyi Ulbr., Bericht. Deutsch. Bot. Gesell. 50 (1932) 295.

Peridium up to 5×4.5 cm. diam., globose or obovate, white, attached by a stout white, single or branched cordlike mycelium. *Receptacle* up to 14×2 cm., white, hollow cellular, wall of several layers, cylindrical, round or elliptic, apex perforate or not. *Pileus* up to 5 cm. high, 3.2 cm. at widest part, campanulate, usually deeply rugulose-reticulate, with large, equal or elongated chambers, in the base of which are secondary shallow reticulations, latter up to 3 mm. deep, with even or incised edges; attached apically to a white, caplike expansion of the apex of the stem. *Indusium* white, closely convoluted and rugulose when immature, developing into an open network structure, in which the meshes are about 1.5-3 mm. diam., subglobose to irregularly polygonal and the walls of the meshes elliptic, the long axis at right angles to the stem; attached to the apex of the stem and hanging down between the stem and the pileus, fairly straight or flared at the lower margin, up to just above the volva. *Spores* tinted, smooth, broadly elliptic, about $3.5-4.5 \times 2.5 \mu$.

Habitat: solitary or in clusters, in soil and decaying leaves, after rain.

Distribution: Africa; North and South America; Asia; Australia; Ceylon; India; East and West Indies.

Specimens examined: Inanda, Natal, Haygarth (Medley Wood 667: Herb. Kew as *Phallus indusiatus*) 11050; Pinetown, Natal, Medley Wood 669 as *P. indusiatus*, 11051; Mbabane, Swaziland, L. Hendricks, 15047; Richmond, Natal, May 1925, Miss Viryan, 20413; Newlands, Cape, June 1929, K. Lansdell, 24380; July 1929, E. L. Stephens 55 as *D. duplicatus* (Bosc.) Ed. Fisch., 24379; Hopevale, Donnybrook, Natal, Jan. 1935, K. Morgan, 34921; Natal, D. Weintraub, 34920; Pietermaritzburg, Natal, Nov. 1936, R. Fuller (Rump 457); Qudeni Forest, Zululand, Feb. 1945, P. Talbot, 34909; (Kirstenbosch, Cape, July 1929, R. Marloth 14045 as *D. phalloidea*, 26588, is a *Clathrus*); Cape Peninsula, E. L. Stephens, 426, 555, 556.

Specimens not seen: Inanda, Natal, Medley Wood ? 667 at Kew; Angola, Welwitsch as *P. phalloidea* Desv.; Hogsback, Alice Distr., Cape, Jan. 1939, E. L. Stephens 426.

The South African plant differs from the type figured by Alf. Moeller for Brazil (Brasilische Pilzblumen, 1895; tab. 1, 4, 8) as *D. phalloidea* and reproduced by Ed. Fischer (Nat. Pflanzenfam., 1933: 106) as *D. indusiata* (Pers.) Ed. Fisch. by C. G. Lloyd (Myc. Writ. 3, Syn. Phall., 1909: 19) as *D. Moelleri* and by R. Marloth (Fl. South Africa 1, 1913: 30) as *D. phalloidea* in the following characters:—The net, even when first expanded, is never so campanulate and rigid or proportionally so long, the walls of the meshes are elliptical and deeper in the horizontal axis and the meshes are more angular and not so large.

CLATHRACEAE Ed. Fischer.

Natürlichen Pflanzenfamilien 1** 1 (1900) 280.

Peridium of three layers, subglobose, oval or obovate, splitting irregularly at the apex to allow for the development of the receptacle, at the base of which it remains behind as a volva collapsed against the stem. Receptacle stipitate or sessile, cellular or tubular, of a turgid, spongy, brittle texture, consisting either of a number of simple columns united at the apices but free at the base, or of a simple, hollow, cylindrical stem from the apex of which arise either a number of free connivent, or apically united armlike processes, or a simple or processed clathrate dome, or consisting entirely of a number of arms fused at intervals to form a hollow, latticed dome. Spore mass mucilaginous, olivaceous, foetid, borne on the armlike structures of the receptacle, whether free or formed into a clathrate sphere. Spores smooth, hyaline, bluntly cylindrical. Basidia 4-8-spored.

Key to the Genera (sec. Cunningham).

- A.—Receptacle composed of a number of columns, fused at the apices but basally free.
1. Spore mass borne on the inner surface of smooth or transversely rugose columns..... 1. **Linderiella**.
 2. Spore mass borne on the inner surface of lateral expansions of the columns (*Blumenaria*).
 3. Spore mass borne on a pulvinate structure pendant from the inner side of the fused apices of the columns..... (*Laternea*).
- B.—Receptacle composed of a hollow, cylindrical stem, the apex of which gives rise to a number of armlike structures.
1. Arms originally fused at the apices. Spore mass borne on the inner surface of rugulose arms..... 2. **Anthurus**.
 2. Arms connivent and usually organically free at the apex. Spore mass surrounding rugulose arms except for a central longitudinal furrow on the outer surface..... 3. **Lysurus**.
 3. Arms laterally attached to a horizontal, discoid expansion of the apex of the stem. Spore mass borne on the upper side of the arms and disc.... 4. **Aseroe**.
- C.—Arms united to form a hollow, spherical, latticed type of stipitate or non-stipitate receptacle.
1. Arms forming a simple, hollow, latticed sphere.
 - a. Spore mass borne on the inner surfaces of the arms..... 5. **Clathrus**.
 - b. Spore mass borne on the inside of the fusion point of the arms 6. **Clathrella**.
 2. Arms forming a spherical, latticed structure on the apex of a well-developed, cylindrical, hollow stem.
 - a. Latticed dome simple. Spore mass borne on the sides of the rugulose arms..... (*Simblum*).
 - b. Latticed dome furnished with radiating armlike processes. Spore mass borne on the sides of the arms and on the processes.... 7. **Kalchbrennera**.
 3. Arms forming a hollow, latticed sphere, supported on several columns basally attached to a short hollow, flaring, tubular stem..... (*Colus*).

Fischer (Gastero. in Nat. Pflanzenfam., 1933 : 83) includes five additional genera in the Clathraceae—*Colonnaria*, *Ileodictyon*, *Pseudocolus*, *Mycopharus*, *Claustula*. These, however, Cunningham rejects on the grounds either that they are not sufficiently well described or that they are not sufficiently well defined to rank as separate genera. He rejects *Colonnaria* for the first reason, and substitutes *Linderiella*; *Ileodictyon* and *Clathrella* he considers synonyms of *Clathrus*, *Pseudocolus* a synonym of *Anthurus* and *Mycopharus* a synonym of *Lysurus*. *Claustula* he transfers to the Phallaceae.

Of the genera included in the key and so far not found in South Africa, *Blumenavia* is limited to Brazil; *Laterna* is confined to the West Indies; *Simblum* is found in North and South America and the East and West Indies; *Colus* is found along the Mediterranean and in Australia.

Kalchbrennera, *Anthurus*, *Lysurus*, *Clathrus* and *Clathrella* definitely occur in South Africa; *Aseroe* and *Colus* have both been reported from this country, but their occurrence seems doubtful.

1. **LINDERIELLA** G. H. Cunningham.

New Zealand Journal of Science and Technology 23 (1942) 171 B.

Linderia G. H. Cunn., Proc. Linn. Soc. N.S.W. 56 (1931) 192.

Colonnaria Raf., N.Y. Med. Rep. Hax. 5 (1808) 355; Fisch. Gastero. in Nat.

Pflanzenfam. 7a (1933) 84.

Type species: *Linderiella columnata* (Bosc.) G. H. Cunn.

Peridium subglobose, white or greyish. Receptacle of simple columns, organically united at the apex, but free and tapering at the base. Columns chambered, pseudoparenchymatous, smooth or transversely wrinkled, not winged, bearing on the inner surface the mucilaginous, olivaceous spore mass. Spores elliptical, smooth. Basidia 4-8-spored.

Cunningham originally erected the genus *Linderia* to include species answering to the above description, but later renamed it *Linderiella*, on account of the similarity of the name to *Lindera*, a flowering plant. Fischer resuscitated the genus *Colonnaria* Raf. for such species, but Cunningham rejected this name on the grounds that Rafinesque did not describe or illustrate his genus.

Linderiella columnata (Bosc.) G. H. Cunningham. [Plate XX, fig. 1, 2.]

New Zealand Journal of Science and Technology 23 (1942) 171 B.

Clathrus columnatus Bosc., Mag. Gesell. Nat. Freunde 5 (1811) 85.

C. colonarius Leman, Dict. Sci. Nat. 9 (1817) 360.

Laterna columnata Nees & Henry, Syst. der Pilze 2 (1858) 96.

Laterna angolensis Welw. & Curr., Trans. Linn. Soc. London 26 (1870) 286.

Clathrus angolensis (Welw. & Curr.) Fisch., Versuch. Phall. (1886) 70.

Clathrus cancellatus f. *columnatus* Ed. Fisch., Denkschr. Schw. nat. Gesell. 32 (1890) 56.

C. trilobatus Cobb, Rept. Exp. Sta. Hawaii, Bull. 5 (1906) 209.

Linderia columnata (Bosc.) G. H. Cunn., Proc. Linn. Soc. N.S.W., 56 (1931) 193.

Colonnaria columnata (Bosc.) Ed. Fisch., Nat. Pflanzenfam. 7a (1933) 84.

Peridium 3-6.5 cm. diam., subglobose, white or greyish flecked with brown. Receptacle 12 cm. high, of 3-5, commonly 3-4, columnar arms, basally free, acuminate pointed, organically united at the apex, arched slightly outwards, chambered, transversely rugulose or papillate on the inner side, longitudinally striate on the outside, shading from pale orange at the base to scarlet at the apex. Spore mass olivaceous, mucilaginous, borne on the inner surfaces of the upper portions of the arms. Spores bluntly cylindrical, tinted, smooth. $4-6 \times 1.5-2 \mu$. Smell foetid, said by Welwitch and Curry, l.c., to resemble the odour of fermenting wine. (Description ex Cunningham l.c. and Welwitsch & Currey, l.c. sub *Laterna angolensis*.)

Habitat: in humus.

Distribution: North and South America; Africa; Hawaii; New Zealand; West Indies.

African Record: on humus-covered soil, at Catete, Pungo Andonga, Angola, Dec. 1856, *Welwitsch* 120.

According to Cunningham, the plant shows variations in colour, number and shape of the columnar arms. It differs from *Clathrus*, with which it has been confused, in that the arms are free, not united at the base. The Angola plant is not a *Laternea* as described by Welwitsch and Currey (l.c.) since the spore mass is borne, not on a projection from the anastomosed apex of the inner walls of the arms, as in that genus, but on the walls themselves. Following Cunningham, it has been referred to *Linderiella columnata* (Bosc.) Cunn. It differs from the New Zealand plant mainly in colour—being white instead of some shade of yellow or red—and in smell.

2. **ANTHURUS** Kalchbrenner and MacOwan.

ex Kalchbrenner and Cooke, *Grevillea* 9 (1880) 2.

emended G. H. Cunningham, *Proc. Linn. Soc. N. S. Wales* 56 (1931) 185.

Pseudocolus Lloyd, *Myc. Writ.* 2, *Myc. Notes* 28 (1907) 356.

Type species: *Anthurus Archeri* (Berk.) Ed. Fischer.

Peridium globose, oval or ovate, splitting irregularly at the apex, strongly rooting. Receptacle a short, hollow, cellular, cylindrical or flaring stem-like structure, dividing at the upper margin into a number (3–8) of simple, sub-cylindrical, cellular arm-like processes, which are originally organically united at the tips, but which usually break free on expansion. Spore mass dark olive green, mucilaginous, foetid, borne on the inner surfaces of the arms. Spores bluntly elliptical, smooth, hyaline or tinted.

Anthurus Archeri (Berkeley) Ed. Fischer. [Plate XXI, fig. 1, 2.]

Jahrbuch der Koeniglichen botanischen Gartens und botanischen Museums, Berlin 4 (1886) 81; emend. G. H. Cunn., *Proc. Linn. Soc. N. S. Wales*, 56 (1931) 186.

Lysurus Archeri Berk., *Fl. Tasmania* 2 (1860) 264.

L. pentactinus Berk., l.c., Tab. 184.

Anthurus Muellerianus Kalchbr., ex Kalchbrenner & Cooke, *Grev.* 9 (1880) 2.

A. Muellerianus f. *aseroeformis* Ed. Fisch., *Denkschr. Schweiz. nat. Gesell.* 32 (1890) 68.

A. sepioides McAlp., *Victorian Nat.*, 20 (1904) 42, nomen nudum.

A. aseroeformis (Ed. Fisch.) McAlph., in Lloyd, *Myc. Writ.* 2, *Myc. Notes* 31 (1908) 408.

Pseudocolus Archeri (Berk.) Lloyd, *Myc. Writ.* 4, Letter 47 (1913) 14.

Anthurus MacOwani Marloth, *Flora of South Africa* 1 (1913) 22, Pl. 3.

Pseudocolus mauritianus Lloyd, *Myc. Writ.* 5, *Myc. Notes* 49 (1917) 689.

Anthurus surinamensis Ed. Fischer., *Ann. Myc.* 25 (1927) 471.

Peridium 1.7–5 cm. high, 1.7–3.2 cm. wide, globose, oval or ovate, white, splitting irregularly at the apex, attached by means of a stout, white, much branched mycelial cord, branches sometimes firmly attached to tree roots. Peridia usually single, but two to three closely adpressed eggs may be attached to one rooting system. *Receptacle* composed of a short stalk-like base, flared at the margin but attenuated towards the point of attachment to the volva, and dividing at the apical margin into 4–6, long, sub-cylindrical, arm-like processes, which are originally connivent and organically united at the tips and on the inner side of which the spore mass is borne. *Stem* 1–5 cm. long, about 2.5 cm. wide at upper margin, hollow, brittle, spongy, cellular, walls of 1–2 layers of cells which occasionally open towards the outside, but for the most part are closed inside as well as outside, transversely and strongly rugulose, white at the base, reddish above. *Arms* up to 14 cm. long

and 2 cm. diam. at widest part, lanceolate acuminate, the tips originally anastomosed together, but usually soon separating and becoming flared and recurved; strongly transversely rugulose, rounded on the inside, flattened and centrally channeled on the outside, spongy, brittle, cellular, not hollow—consisting of up to 7 layers of large and small cells, the largest on the inside and the smaller towards the outside; bright red (Nopal Red) on the inside, whitish on the outside, but tinged with red towards tip. *Spore mass* greenish black, borne on the inner side of the rugulose arms, at first distributed, later concentrated in patches. *Spores* tinted greenish, smooth, bluntly cylindrical, about $6.6.8 \times 2 \mu$ (in alcohol).

Habitat: in wooded places, often under oak trees, occurring singly, in groups or caespitose, appearing after rain.

Distribution: South Africa; Australia; Malay Archipelago; Mauritius; New Zealand; Tasmania.

Specimens examined: Stellenbosch, Nov. 1916 and June 1927, *Duthie 173* (E.L.S. 411) 31381; June 1932, *Duthie 343* as *Pseudocolus*, 31496; Oranjezicht, Capetown, July 1929, *A. M. Bottomley*, 24371; near oaks and pines, Papegaisberg, June 1941, *M. de Vos*; Stellenbosch, *P. v. d. Byl 2332*; Kirstenbosch, Aug. 1934, *J. Acocks* (E.L.S. 334); Capetown University grounds, May 1939, *E. L. Stephens 552*; Oranjezicht woods, Cape Town, June and July, 1925–1929, *J. U. L. Rennie* and *E. L. Stephens* (E.L.S. 168, 417).

Specimens not seen: Somerset West, *C. P. Pillans*; Stellenbosch, *v. d. Byl 2101*.

This is the only species of *Anthurus* known in South Africa. It is fairly common in oak woods in the South Western coastal area, where winter rainfall conditions prevail, but it has not so far been found elsewhere. It often occurs in clusters, which present a beautiful sight, often being mistaken for bright red flowers. Like all phalloids it is very brittle and quickly collapses, which probably accounts for the small number of specimens in Herbaria.

The species is recognised by its brilliant red colour, the long rugose arms, which spread out like the petals of a flower, and the greenish black, slimy spore mass on the inside of the arms. Growing as it does amongst leaves, the arms appear to come straight out of the ground.

Marloth (l.c.) described the plant as a new species, on advice from Lloyd to whom he submitted a coloured illustration. Lloyd (Myc. Writ. 4, Myc. Notes 41, 1916: 570), however, later admitted that the South African plant looked very much like the Australian, which he said he knew imperfectly at the time and of which he had seen no illustration. There seems little doubt that the two are the same. Uncertainty has probably arisen owing to the fact that in the South African plants the tips of the arms apparently separate at a very early stage of expansion. A study of numerous alcohol specimens, however, shows several cases of joined tips—some united by only a single layer of cells, others by a band of tissue.

3. *LYSURUS* Fries.

Systema Mycologicum 2 (1822) 285.

Aseroephallus Lepr. et Mont., Ann. Sci. Nat. Ser. 3, 4 (1845) 360.

Pharus Petch, Ann. Bot. Gard. Perideniya, 7 (1919) 59.

Mycopharus Petch. Trans. Brit. Myc. Soc. 10 (1926) 281.

Type species: *Lysurus Mokusii* (Linn.) Fr.

Peridium subglobose, splitting at the apex into several irregular lobes. Receptacle consisting of a well-developed, hollow, spongy, cellular, cylindrical stem, which bears at its apex a number of rugose, acuminate, erect, usually apically free, armlike processes.

Spore mass mucilaginous, foetid, borne on the rugose tissue of which the whole arm, except for a narrow, longitudinal, central channel on the outer surface, is composed. Spores tinted, smooth, bluntly cylindrical.

The two genera *Anthurus* and *Lysurus* were confused for a long time and to Lloyd is due much of the credit for straightening out some of the differences. In *Lysurus* as seen in South African plants, the stemlike portion of the receptacle is well-developed and cylindrical, the arms are short in proportion, the arm tips are connivent, but nearly always separate, and the spore mass is borne all over the arms except for a narrow, longitudinal, slightly wrinkled channel in the centre of the outer surface. In *Anthurus* on the contrary, the stemlike portion is short and flaring, the arms are proportionately long, the arm tips originally organically united, but later usually free and flaring; the spore mass is confined to the inner side of the arms, where it is concentrated in patches at maturity. A central longitudinal furrow is present on the outside of the arms.

According to Cunningham, only four of the nine described species of *Lysurus* are good species—*L. Mokusii*, reported from Asia, Australia and California and distinguished by its angled and fluted stem and strongly connivent arms; *L. cruciatus*, reported from French Guiana, a very small species with four arms, in which the spore mass is borne between the arms on the top of the stem; *L. Gardneri*, described later and *L. Woodii* confined to South Africa. The latter was, however, considered by Lloyd (Myc. Writ. 5, Myc. Notes 55, 1918 : 792) to be the same plant as *L. borealis*, the American form of *L. Gardneri* and this opinion is upheld by the writer. The number of good species would therefore be three only.

Lysurus Gardneri Berkeley. [Plate XXII.]

Hooker's London Journal of Botany 5 (1846) 535.

G. H. Cunn., Gastero. (1944) 105.

Lysurus texensis Ellis, Bull. Torrey Bot. Club 7 (1880) 30, nomen nudum.

Anthurus Woodii MacOwan in Kalchbr. Phall. novi vel minus cognita (1880) 23.

Colus Gardneri (Berk.) Ed. Fisch., Jahrb. Bot. Gart. Mus. Berlin 4 (1886) 77.

Mutinus sulcatus Cooke et Massee, ex Cooke, Grev. 17 (1889) 69.

Lysurus australiensis Cooke et Massee, ex Cooke, Grev. 18 (1889) 6.

Anthurus australiense (Cooke et Massee) Ed. Fisch., Denkschr. Schweiz. nat. Gesell., 33 (1893) 27.

A. borealis Burt, Mem. Boston Soc. Nat. Hist. 3 (1894) 504.

L. borealis (Burt) P. Henn., Hedwigia 41 (1902) 167.

L. borealis var. *Klitzingii* P. Henn., l.c., p. 173.

L. Woodii (MacOwan) Lloyd, Myc. Writ. 3, Syn. known Phall. (1909)

L. tenuis Bailey, Comp. Cat. Queensland Plants (1910) 745.

Pharus Gardneri (Berk.) Petch, Ann. Bot. Gard. Perideniya 7 (1919) 59.

Mycopharus Gardneri (Berk.) Petch, Trans. Brit. Myc. Soc. 10 (1926) 281.

Lysurus sulcatus (Cooke et Massee) G. H. Cunn., Proc. Linn. Soc. N. S. Wales 56 (1931) 189.

Peridium up to 4 cm. diam., subglobose, white, splitting at apex into several irregular lobes, attached to soil by white mycelial strands. *Receptacle* composed of a well-developed stem, which bears at its apex, where a constriction may or may not be present, 5-7 rather short, erect, or later flaring, arm-like processes on which the spore mass is borne. *Stem* 3-14 cm. long, 0.5-3.8 cm. diam at apex, 0.3-1.5 cm. diam. at base; cylindrical or slightly

to strongly attenuated towards the base, hollow, brittle, cellular, wall 1-3-chambered, cells closed on the inside but usually finally open on the outside, white at the base, whitish or tinged pinkish-yellow, waxy yellow or pinkish orange (Pinkish Buff) in the central part and finally warm buff (between Cinnamon and Mikado Brown) at apex. *Arms* 5-7 (MacOwan recorded 8-9), acuminate, up to 5 cm. long, usually about 2 cm., 7 mm. diam. at base, arising from the apical margin of the stem and in some cases attached to a semi-transparent membrane, sub-triangular, flattened on the outside and rounded-angular on the inside, transversely deeply rugose all over the arm except for a slightly wrinkled, central, longitudinal channel on the outside, the rugose tissue extending from the base of one arm to the next in hair-pin bend fashion; pinkish orange (in specimens seen by me) orange red, rose red, scarlet or sometimes white, the colour being conspicuous along the spore-free channel; tips connivent, two or very occasionally three, originally organically united, but usually free, erect or becoming flared, held erect at the base by the thick spore mass filling the space between the apex of the stem and the arms. *Spore mass* fuscous brown, mucilaginous, copious, covering the entire rugose surface of the arm except for the outside channel. *Spores* bluntly cylindrical, smooth, tinted, $4.4-5 \times 1.5-2 \mu$, average size $4 \times 1.6 \mu$. *Smell* foetid, reported by MacOwan to be "ten times worse than *Phallus impudicus*".

* *Habitat*: under wattle trees in cattle-manured ground, manured gardens, damp soil, occurring singly or in large clusters.

Distribution: South Africa; North America; Australia; Ceylon; England; Germany; India; Java.

Specimens examined: Inanda, Natal, 1877/78, *J. Medley Wood* 134, 10376, 22036 (Kew as *Anthurus Woodii* Kalchbr.); Hopevale, Donnybrook, Natal, *K. E. Morgan*, Jan. 1935, 27741, Feb. 1936, 28536, May 1936, 28607; Putfontein, nr. Benoni, Tvl., Feb. 1929, *Miss v. d. Merwe*, 23685; Johannesburg, Jan. 1921, *J. B. Wood*, 14245; de Kuil, Standerton Distr., Tvl., Dec. 1924, *Roos*, 20355; Brenton, Knysna, June 1924, *A. V. Duthie* (E.L.S. 54) 31508, April 1935, *A. V. Duthie* 338 (v. d. Byl 2369 as *Anthurus Woodii*), *A. V. Duthie* 331 (v. d. Byl 2334; Lloyd Myc. Coll. 24890, 24891, 27631); Grahamstown, Aug. 1941, *Miss E. Archibald*, 33215.

Specimens not seen: Inanda, Natal, *J. Medley Wood* 149; Ixopo, Natal, *Mrs. J. C. Hackland* as *Lysurus Woodii*; Brenton, Knysna, *Duthie and Mason* (Duthie 341).

This is the only species of *Lysurus* so far found in South Africa. It is recognised by its well-developed, usually pinkish-orange stem, which bears at its apex a number of comparatively short, connivent, armlike, yellow-scarlet processes, around which, except for a narrow, longitudinal central channel on the outer surface, the fuscous brown spore mass is borne. Cunningham does not mention the external channel, which is presumably absent in Australian plants.

The plant is very variable in size, colour and attachment of the arm tips. Cunningham describes the arms, after removal of the spore mass, as orange red; van der Byl (Trans. Roy. Soc. S. Africa 9, 1921: 191) found them to be white in Natal plants and partly on this character supported his claim for retaining *L. Woodii* as a separate species; MacOwan (l.c.) described them as "magnificent yellow-scarlet like *Clathrus*" and in Natal plants seen by the author they were pinkish orange.

The arm tips in the South African plant are connivent but usually free. In a couple of cases two tips have been found organically united, in one case apically by a thin strip of tissue and in the other laterally, by so broad a layer of tissue that it was impossible to separate them. Variation in the number of arms and in the tip attachment has been responsible for the numerous names this plant has received.

It is considered that v. d. Byl's arguments for retaining *L. Woodii* as a separate species fall away in the light of Cunningham's interpretation of *L. Gardneri*.

The foregoing description was largely made from numerous plants "hatched out" in the laboratory from "eggs" kindly supplied by Miss K. E. Morgan of Hopevale, Donnybrook, Natal.

4. **ASEROE** La Billardiere ex Fries.

Systema Mycologicum 2 (1822) 285; Labill., Relation du voyage recherche de la Perouse (1800) 145.

Calathiscus Mont., Ann. Sci. Nat., Ser. 2, 16 (1841) 278.

Type species : *Aseroe rubra* Labill, ex. Fr.

Peridium globose or obovate, splitting at the apex into a number of irregular lobes. Receptacle of a well-developed, cellular, hollow, cylindrical or flaring stem, which gives rise at the apex to a horizontal, disc-like structure, extending inwards to form a centrally perforated diaphragm over the apex of the stem and outwards to form an expansion from which a number of simple or forked, long, acuminate, rugulose arms radiate. Spore mass mucilaginous, olivaceous, foetid, borne on the upper side of the diaphragm, disc expansion and adjoining arms. Spores hyaline or tinted, smooth, bluntly cylindrical.

Of the nine species of *Aseroe* described, both Fischer and Cunningham recognise only two as valid—*A. arachnoidea*, a white plant with simple arms attached to a very small disc, which occurs in Borneo, Cochin China, Java and Sumatra and *A. rubra*, a red plant with arms attached to a well-developed disc. Fischer (Gastero., Nat. Pflanzenfam., 1933: 93) further divides the latter species into six varieties.

It is uncertain if this genus is represented in South Africa, but in view of the fact that a collection, identified as *A. rubra* has been recorded from the South Western Cape area, a description of this species (taken from Cunningham) is given.

Aseroe rubra La Billardiere ex Fries. [Plate XX, fig. 3.]

Systema Mycologicum 2 (1822) 285.

Aseroe pentactina Endl. Icon. Pl. Gen. (1838) 50.

A. viridis Berk. et Hook., Lond. Journ. Bot. 3 (1844) 192.

A. ceylanica Berk., Lond. Journ. Bot. 5 (1846) 535.

A. actinobola Corda, Icon. Fung. 6 (1854) 23.

A. multiradiata Zoll., Syst. Verz. (1854) 11.

A. Hookeri Berk., Fl. New Zealand 2 (1855) 187.

A. corrugata Col., Trans. New Zealand Inst., 16 (1884) 362.

A. rubra f. *Muelleriana* Ed. Fisch., Jahrb. Bot. Gard. Mus. Berlin 4 (1886) 88.

A. lysuroides Ed. Fisch., l.c., p. 89.

A. rubra f. *ceylanica* (Berk.) Ed. Fisch., Denkschr. Schweiz. Nat. Gesell. 32 (1890) 75.

A. Muelleriana (Fisch.) Lloyd, Syn. Phall. in Myc. Writ. 3 (1909) 46.

A. pallida Lloyd, l.c., p. 47.

A. poculiforma Bailey, Comp. Cat. Queensland Plants (1910) 746.

Peridium up to 3 cm. diam., globose or obovate, dingy white or grey, sometimes fuscous. *Receptacle* consisting of a well-developed stem, up to 6 cm. long, 2 cm. diam., cylindrical or flaring, hollow, cellular, white below, pink above, giving rise abruptly at the apex to a usually broad, horizontal, round, disc-like structure up to 3.5 cm. diam., which extends inwards to form a centrally perforated, rugulose or smooth, white, yellow or red, diaphragm over the apex of the stem and, outwards, to form a rounded expansion from the margin of which armlike processes, with often twisted or curled ends, radiate. *Arms* up to 3.5 cm.

long, 6 mm. wide at the base, in 5-9 pairs, longitudinally grooved at the base, rugose on both surfaces or almost smooth, bifurcate about 15 mm. from the base or sometimes only near the apices, typically some shade of orange or red, sometimes white. *Spore mass* mucilaginous, olivaceous, covering the upper side of the diaphragm, disc expansion and adjoining basal portions of the arms. *Spores* hyaline or tinted, smooth, bluntly cylindrical, $4.5 \times 1.5-2 \mu$. *Smell* foetid.

Habitat : on ground or rotting wood.

Distribution : Australia ; Ceylon ; England ; Malay Archipelago ; New Caledonia ; New Zealand ; Tasmania ; ? South Africa.

South African Records : only one collection of *Aseroe rubra* has been recorded from South Africa—that in Kew Herbarium collected by the botanist W. T. Saxton at Cape Town. While it is, of course, possible that the plant does occur here, it seems rather doubtful, in view of the fact that no other collection is recorded and that the same phalloids come up regularly year after year in the area in question. The plant may conceivably have been confused with *Anthurus Archeri*, which is also red and which occurs quite commonly in the Cape Town area, especially if the identification was made from a dried specimen.

Lloyd (Synop. Phall. in Myc. Writ. 3, 1909 : 44) mentions a very imperfect, dried specimen of *Aseroe* from Africa in Berlin which was, however, in too poor a condition for him to attempt to identify.

Clathrus and Clathrella.

Clathrus and *Clathrella* are the least well-known genera of the phalloids in South Africa, occurrence beyond the coastal belt, a thousand miles from Pretoria, being of a very sporadic nature and usually limited to single plants. Specimens have occasionally been sent to Fischer and Lloyd for identification, but in no case has it been possible to name them exactly. In spite of the lack of definite specific names, however, all forms recorded for South Africa have been included for the sake of future workers on this group.

According to Fischer, *Clathrella* differs from *Clathrus* in the following characters :— Different apex and base, less massive structure, at least partly tubular arms, the presence on the inside, in typical plants, of a projecting chamber at the junctions of the arms, the uniting, basally, of the arms into a short, stemlike structure and the restriction of the spore mass to the axils of the arms, which he contends indicates an anatomical difference.

Fischer considers that *Clathrella* is a transitional form between *Clathrus* and *Colus* which usually has a well-developed basal stem. Cunningham rejects *Clathrella* as a genus distinct from *Clathrus* on the grounds that a stemlike base may be present or absent in different plants of the same collection. In view, however, of the fact that the basal character is only one of the characters on which Fischer bases his genus and that equal if not more emphasis is placed on the presence of wartlike projections at the junctions of the arms to which the spore mass is restricted, there would appear to be some justification for the erection of *Clathrella* based on a combination of differences. It is therefore proposed, until such time as the South African phalloids are better known, to retain the genus *Clathrella*.

5. CLATHRUS Micheli ex Persoon.

Synopsis Methodica Fungorum (1801) 241.

Clathrus § *Clethria* Fr., Syst. Myc. 2 (1822) 287.

Ileodictyon Tul., Ann. Sc. Nat., Ser. III, 2 (1844) 114.

Type Species : *Clathrus ruber* Mich. ex Pers.

Peridium subglobose or obovate, dirty white. Receptacle composed of a number of arms which fuse at intervals to form a hollow, spherical or egg-shaped latticed structure,

usually free at the base but occasionally attached to a shallow, substipitate, stemlike structure. Meshes polygonal and usually equal, occasionally somewhat elongated towards the base. Arms usually thick and massive, sometimes slender, not decreasing appreciably in thickness towards the apex; subtriangular to polygonal or sometimes elliptical in cross section, usually wrinkled, consisting of several layers of short, sometimes tubular cells, which frequently open on the inside. Spore mass mucilaginous, olivaceous, foetid, borne all over the inner sides of the arms. Spores smooth, tinted, bluntly elliptical (see Fischer in Nat. Pflanzenfam., 1933 : 84).

1. *Clathrus cibarius* (Tulasne) Ed. Fischer.

Jahrbuch der k niglichen botanischen Gartens und botanische Museums zu Berlin, 4 (1886) 74.

Sacc. Syll. Fung. 7 (1888) 20; Lloyd, Myc. Writ. 3, Syn. Phall. (1909) 60, fig. 78, Myc. Notes 34 (1910) 447; Cunn. Gastero. Aus. and N.Z. (1944) 110.

Ileodictyon cibarius Tul., Ann. Sci. Nat., Ser. 3, 2 (1844) 114.

Clathrus tepperianus Ludw., Bot. Centralbl. 43 (1890) 7.

Ileodictyon giganteum Col., Trans. N.Z. Inst., 25 (1893) 324.

Clathrus Higginsii Bailey, Queensland Agr. Journ., 29 (1912) 48.

Peridium up to 7 cm. diam., subglobose to obovate, dirty white. *Receptacle* white, up to 15 × 10 cm. diam., subglobose to obovate, composed of brittle, spongy arms, which anastomose at intervals to form a sessile, clathrate structure. Arms elliptical or sub-cylindrical in section, cellular or sometimes tubular, not or only slightly thickened at the junction of the arms, transversely rugulose all round the arms. *Meshes* more or less polygonal. *Spore mass* deposited on inside of arms. *Spores* elliptical, 4-6 × 1.8-2.5 μ (sec. Cunningham), tinted, smooth.

Habitat: on ground in open places or under bushes.

Distribution: South Africa; Australia; New Zealand.

Specimens examined: on ground, Salisbury, Rhodesia, *F. Eyles & Green* (Eyles 4139; v. d. Byl 2346). Specimens at Stellenbosch.

Specimens not seen: on ground under bushes, Table Mt., Cape Town, *MacOwan*; Beatrice, S. Rhodesia, *Eyles 4098*.

This species has often been confused with *Clathrus gracilis*. It is of the same size, shape and colour, but differs in having sub-cylindrical rugose arms, which are not appreciably thickened at their junction with one another. An examination of alcohol-preserved material in sealed containers—the only specimens available for examination—indicated that the spore mass in *C. cibarius* is distributed all over the inside of the arms but is concentrated at the junction of the arms where there appeared to be protuberances. This point needs confirmation from fresh specimens.

C. cibarius is only known for certain from Southern Rhodesia. *MacOwan's* collection, of which no specimens have been found, was quite probably *C. gracilis*, the commonest phalloid and the only *Clathrus* found in the Cape peninsula.

Fischer places both *Clathrus cibarius* and *C. gracilis* in the genus *Ileodictyon*, erected by Tulasne for species with tubular, not chambered arms. Cunningham, however, discards this genus on the grounds that "the type species *C. cibarius*, contains plants with both tubular and cellular arms, small plants possessing tubular and large ones cellular arms".

2. *Clathrus gracilis* (Berkeley) Schlechtendal. [Plate XXV, fig. 1.]

Linnaea 31 (1861) 166.

G. H. Cunn., Gastero. Aus. and N.Z. (1944) 111; C. C. Brittlebank in Lloyd Myc. Writ. 4, L. 60 Note 395 (1915) 16.

Neodictyon gracile Berk., London Journ. Bot. 4 (1845) 69.

Clathrus albidus Lothar ex. Fisch., in Sacc. Syll. Fung. 7 (1888) 20.

C. intermedius Fisch., Denkschr. Schweiz. nat. Gesell. 33 (1893) 20.

Peridium whitish, more or less oblong or obovate, 3–7 cm. diam. *Receptacle* white, often lop-sided, usually large, 4–13 cm. high, 5–9 cm. wide, sessile, free from the volva when fully expanded. *Meshes* large, up to 4 cm. diam. *Arms*, white, smooth or longitudinally ridged, flattened, ribbon-like, usually 3–5.5 mm. wide, but reaching 5–10 mm., including the fringed margin when present; consisting of one, two or more tubular chambers expanded at the fusion of the arms, sometimes conspicuously so, especially at the apex; margins of arms smooth or fringed. *Spore mass* distributed over the inner surfaces of the arms when expanded, mucilaginous, olive or sage green. *Spores* elliptical, smooth, tinted, 5.6×1.8 – 2.5μ . *Smell* rather like ensilage, described by Miss E. L. Stephens as "sweet with an underlying sourness; not foul like *Phallus* and *Anthurus*".

Habitat: in woods and open ground.

Distribution: Cape Peninsula in South Africa; Australia; Tasmania.

Specimens examined: Kirstenbosch, June 1917, *M. R. Levyns* (E.L.S. 167); Aug 1945, *R. H. Compton* (E.L.S. 569); in woods on slopes of Table Mt., Newlands, June 1929, *A. M. Bottomley* and *K. A. Lansdell* (E.L.S. 80); Groot Schuur Estate, Rondebosch, *J. Acocks* (E.L.S. 128); frequently collected by Miss E. L. Stephens in these localities during the last twenty years from June to August.

Specimens not seen: without locality. Lloyd (Myc. Writ. 3, Syn. Phall. 1909: 62) mentions a very poor South African specimen at Paris labelled *C. Fischeri*, which he thought was *C. gracilis*. MacOwan records *C. cibarius* from Table Mt., Cape, but this was probably *C. gracilis* since the former is not known to occur in the area in question.

Miss E. L. Stephens of Cape Town University to whom I am indebted for most of my information about *C. gracilis*, states that this is the commonest phalloid in the Cape Peninsula. She considers the Cape plant a more robust and often larger form than the dried Australian specimen she saw at Kew.

C. gracilis is distinguished from other species by its white colour and flattened, ribbon-like arms.

3. *Clathrus* sp. [Plate XXVII.]

Peridium sub-globose, 2.3×2.2 cm., white, splitting irregularly at the apex, attached by a stout mycelial cord. *Receptacle* obovate, 7.13×5.8 cm., arms united at the base into a short, hollow, stemlike structure up to 1.5 cm. high, at first apricot colour, finally Cornelian Red at apex and Salmon Buff at base (colour of plant developed indoors from an egg). *Meshes* unequal, rounded elliptical to irregular polygonal, varying from 4 mm. diam. at apex to 2.5 cm. towards base. *Arms* rectangular to irregularly polygonal, 3.5 mm. wide, 3–4 mm. deep, enlarged or not at junction of arms, more or less flattened on outer surface, which is undulating to slightly rugulose with a slight to deep longitudinal groove down the centre, inner surface transversely rugulose without wartlike processes at the axils, partly tubular with one large tubular cell on the inner side and several smaller, often exteriorly perforated, short-tubular cells on the outside; margins of outer flattened surface

expanded at intervals into projecting points which give the arms a more or less fringed appearance. *Spore mass* mucilaginous, olivaceous, equally distributed on the inner side of all except the basal arms. *Spores* cylindrical, smooth, tinted, $3.5-5.1 \times 1.6-2.2 \mu$ diam.

Habitat : on sandy or clayey soil in exposed positions, occurring singly.

Specimens examined : Wonderboom, Pretoria, 1926, *A. O. D. Mogg*, 23642 ; on dam wall, Loskop, Tvl., Dec. 1939, *C. A. Blaaser*, 31055.

It has not been possible to identify this species from literature and illustrations at my disposal, and the occurrence of single specimens only has made it impossible to get advice from overseas. The fringed arms suggest *Clathrus Clathrella Preussii*, recorded from the Cameroons, but from this species the local plant differs in colour and the absence of wartlike projections on the fusion points of the arms. From *C. cancellatus* (Lake Nyassa) it differs in shape, less rugulose arms and the presence of an external furrow ; from *Clathrella Baumii* (Zambesi) in the absence of projections at the arm junctions and the distribution of the spore mass ; from *Clathrus Fischeri* (Belgian Congo) in colour and less rugulose arms ; from *Clathrus camerunensis* in colour and more robust arms and, from the other local plant, determined by Fischer as near *Clathrella pseudocancellata*, in the presence of a fringed margin, the absence of axillary cushions which bear the spore mass and the shape of the meshes.

Excluded species.

Clathrus camerunensis P. Henn. [Plate XXV, fig. 2.]

Jahrb. der Botan. Museums zu Berlin, 1890 ; Sacc. Syll. Fung. 9 (1891) 264.

One collection of one specimen only, locality unknown, was sent to Lloyd by Dr. P. A. van der Byl of Stellenbosch for identification (Plate XXV, fig. 2). Lloyd named it *Clathrus camerunensis* (Myc. Writ. 5, Myc. Notes 53, 1918 : 754), adding that it was near *C. gracilis* of Australia. The outstanding feature of the plant was that it was white. Since *C. camerunensis* calls for a white plant with about 9 arms and very slender branches 1.4-2 mm. wide, it is unlikely that the South African plant with only 5 arms and these up to 5 mm. wide is the same plant. It is more likely to be the white species *C. gracillis*, commonly found in the Cape Peninsula.

6. **CLATHRELLA** Fischer.

in Engler & Prantl, *Natürliche Pflanzenfamilien*, 1 Abt.** 1 (1900) 284 and 7a (1933) 87 ; *Entwickl. Syst. Phall. Sec. III* (1900) 35.

Clathrus auctt. pro parte.

Subs. *Clethria* P. Brown ex Corda, *Icones Fungorum* 6 (1854) 25.

Peridium subglobose or obovate, whitish. Receptacle composed of a number of arms which fuse at intervals to form a hollow, spherical, egg-shaped or obovate, latticed structure. Meshes polygonal, rarely round, usually more or less vertically elongated towards the base and often smaller at the apex. Arms cylindrical to flat strap-shaped, free or usually attached to a ring or short stemlike structure at the base, often decreasing in thickness towards the apex, tubular or consisting of only a few layers of chambers of which the innermost one is often larger and long tubular, furnished on the inside with a cushion-shaped projection at the fusion point. Cylindrical arms transversely rugulose all round, flattened arms finely transversely rugulose on the inner side. Spore mass mucilaginous, olivaceous, borne for the most part in small lumps on the wartlike projections at the junctions of the arms. Spores smooth, tinted, bluntly elliptical (see Fischer).

1. *Clathrella Baumii* (P. Henn.) Ed. Fischer.

Gasteromycetes in Engler, Die natürlichen Pflanzenfamilien 2 Aufl. Bd. 7a (1933) 89 (errore '*Cl. Braunii*').

Clathrus (*Clathrella*) *Baumii* P. Henn. in H. Baum, Botanische Ergebnisse der Kunene-Sambesi Expedition (1903) 164; Sacc. Syll. Fung. 17 (1905) 213.

Peridium membranaceous, white, lobed, attached by a white mycelial cord. *Receptacle* oblong-ovoid, reticulated, divided at the attenuated, substipitate base into 5-6 arms, 6-10 cm. high, 3-5 cm. wide, golden-orange. *Arms* slender, 1-layered, tubular, anastomosed, plicate, 2-2.5 mm. broad. *Meshes* polygonal, oblong, 2.5 cm. long, 1.5 mm. wide, bearing on the inside at the axils, a wartlike process. *Spore mass* violaceous black, borne on the wartlike processes at the junctions of the arms. *Spores* oblong, fusoid or cylindrical, $4.5 \times 1.5 \mu$ diam., hyaline. *Smell* foetid. (Description ex Sacc. Syll. Fung. l.c.)

Habitat: in sandy places in forests.

Distribution: Southern Africa.

South African Record: in forests on the Longa R., near Napalanka, Angola, Dec. 1899, *Baum* 601.

No specimens of this plant are available in South Africa for examination. Hennings (l.c.) states that this species is related to both *C. camerunensis* P. Henn. and *C. chrysomycelinus* A. Moell. but differs considerably from both in that in *C. Baumii* the spore mass is borne on small, wart-like cushions about 1-2 cm. broad on the fusion points of the upper arms.

2. *Clathrella* cfr. *pseudocancellata* Ed. Fischer. [Plate XXVI, fig. 1, 2.]

Untersuch. Phalloideen III (1900) 36; Sacc. Syll. Fung. 16 (1902) 228.

Peridium 3-5 \times 2-3 cm. diam., subglobose, white, splitting irregularly at the apex rooting by a stout, branched, white mycelial cord. *Receptacle* 5.75-9.5 cm. high, 4.5-8 cm. wide, subglobose or obovate, usually tapering towards the base, where the armlike processes which anastomose at intervals to form a hollow, spherical, network structure, are united into a short, hollow, stemlike base; reddish-orange or yellow to salmon. *Meshes* 2-4 cm. diam., polygonal, more or less equal or smaller at apex, somewhat vertically elongated towards the base. *Arms* 1.5-8 mm. diam. (pressed specimens), round to rounded triangular, tubular or partly tubular, with one large, continuous tubular cell on the inner side and 2-3 layers of smaller cells on the outside, somewhat tubercular or transversely rugulose on the outside, more strongly transversely rugose on the inner side; thicker and more cellular at the junction of the arms, where a rough, cushion-like structure projects slightly. *Spore mass* olive green, mucilaginous, foetid, borne on the inner surface of the arms - to some extent all over, but principally on the wartlike cushions at the junction of the branches. *Spores* bluntly cylindrical, smooth, tinted $4.5 \times 2.4 \mu$.

Habitat: in sandy soil, damp ground and grass lawns, occurring singly as a rule.

Distribution: Central Africa (Lake Nyassa); South Africa, Rhodesia and Transvaal.

Specimens examined: under citrus tree, de Wagen Drift, nr. Premier Mine, Jan. 1918, A. M. Bottomley, 11231; under bush, Pretoria, March 1917, J. Wickens, 10058; Salisbury, Rhodesia, March and December 1921, F. Eyles 2983, det. Ed. Fischer, 15527; Pretoria, Vos, Feb. 1937, 28777; Pretoria North, Jan. 1941, E. Anderssen, 33333.

The above species is the most common phalloid in the Transvaal. Pickled specimens of the Rhodesian collection (Eyles 2983) were submitted to Fischer for identification, but he was unable to name them exactly. He suggested that this plant was nearest *Clathrella*

pseudocancellata, from which, however, it differed in that the arms were not smooth and ribbon-like, the colour was yellow to salmon instead of reddish orange (reddish-orange plants are common in the Transvaal) and there was no short, stemlike base (this structure is present in some specimens of the same collection kept in Pretoria). Fischer considered that the plant belonged to *Clathrella* on account of the knoblike outgrowths at the junction of the arms of the network. He suggested that possibly *Clathrus Fischeri* Pat. & Har. (Bull. Soc. Myc. France 9, 1893 : 211) collected in the Congo, was the same plant. The latter species is, however, much longer, up to 18 cm. high, and is entirely white.

Judging from descriptions, the South African plant appears to be more nearly related to *Clathrallia Baumii* P. Henn., found in Angola. With this it agrees in colour, size, shape of the meshes and presence of wartlike cushions at the junction of the arms, but differs in that the arms are not always tubular. According to Cunningham, however, this character is variable.

Until more intensive work has been done on the phalloids in South Africa, the name of the plant described is left as suggested by Fischer, viz. *Clathrella* cfr. *pseudocancellata*.

7. **KALCHBRENNERA** Berkeley.

in Gardener's Chronicle, N. Ser., 5 (1876) 785 ; Trimen's Journ. Bot. 14 (1876) 218.

Peridium subglobose, splitting circumscissilely near the apex. Receptacle hollow with spongy, chambered walls, cylindrical or club-shaped, terminating in a dome-shaped clathrate structure, which gives rise to a number of radiating, simple or forked processes. Spore mass borne on clathrate structure and processes.

Type species : *Kalcbrennera corrallocephala* (Welw. & Curr.) Kalchbr.

Distribution : South Africa.

Kalcbrennera corrallocephala (Welwitsch et Currey) Kalcbrenner. [Plates XXIII, XXIV.]
Phalloidei novi vel minus cogniti (1880) 20 ; Ed. Fisch. Untersuch. Phalloideen (1890) 18.

Lysurus corrallocephalus Welw. et Curr., Trans. Linn. Soc. London 26 (1868) 287.

Kalcbrennera Tuckii (Kalchbr. et MacOwan) Berk., Gard. Chron. n.s. 5 (1876) 785 ; Trimen's Journ. Bot. 14 (1876) 218 ; Kalchbr., Phall. novi vel minus cogniti (1882) 106 ; Sacc. Syll. Fung. 7 (1888) 14.

Kalcbrennera Tuckii var. *microcephala* Pole Evans, Records Albany Mus. 3 (1915) 159.

? *Kalcbrennera Tuckii* var. *clathroides* P. Henn., Fungi Camerunensis in Engl. Bot. Jahrb. 22 (1895) 108.

Peridium up to 6.5 cm. high and up to 5 cm. wide, globose, finally obovate, smooth or minutely furfureous, splitting irregularly and circumscissilely just below the apex, the upper portion remaining on the top of the receptacle as a cap, until pushed off by the expanding processes ; white, becoming tinged with yellow when handled ; strongly rooting by a thick, white, cordlike structure. *Receptacle* cylindrical or club-shaped, terminating in a hollow, dome-shaped clathrate structure, sometimes demarcated from the stem by a sudden change of colour, or by a slight constriction caused by a reduction in the number of layers of cells in the stem wall. *Stalk* 3.5–11 cm. long, 0.5–1.5 cm. wide just above base which is narrowed rather abruptly to a blunt point, increasing in size up to 3.5 cm. at the apex, finally hollow, at first filled with a transparent gelatinous substance ; wall consisting of 2–3 chambers which are more or less long and tubular ; closely and finely rugulose, the rounded surface of the wrinkles sometimes externally perforated and the deep

folds sometimes forming almost complete transverse walls across the tubular chambers; white, brownish white or pale yellow (Capucine Buff) at base, deepening in colour towards the apex to a pinky orange (Salmon Orange) or sometimes to the red colour of the clathrate dome. *Clathrate structure* sealing-wax red in colour, consisting of a number of deeply transversely rugulose arms up to 6 mm. diam. and 1-3 chambered, which arise from the apex of the stem and fuse together at intervals to form a number (up to 15 counted) of usually small, irregularly rounded, elliptical or polygonal, thick-walled meshes. The walls of the latter give rise to a number (up to 16 counted) of long or short processes 3.5-10 cm. \times 2-7 mm.; these are radiating, free, concolorous, simple, apically branched or dichotomously forked with, usually, blunt, nail-shaped ends (said by Kalchbrenner, l.c., to resemble the forked thorns of *Carissa arduina* Lam.). These processes, like the arms of the clathrate structure, are one to several chambered, deeply transversely rugulose and cylindrical or depressed below. *Spore mass* sage green, then greenish black, covering all rugulose structures. While still in the egg stage, the gleba completely fills the interstices between the processes, the apices of which are visible on the compact spore mass as scattered, white or red (depending on the stage of development) more or less regular, crescent-shaped, flattened, coralloid structures with open surface cells. *Spores* elliptical, smooth, tinted, 3.4-1.5 μ diam. *Smell* strong and foetid.

Habitat : on ground in wooded thickets, open places or cultivated fields and gardens; occurring singly or in groups after prolonged rains.

Distribution : South Africa.

Specimens examined : Sydenham, Natal, 1882, *J. Medley Wood* 665, 10388, 13075, 31825, Kew as *K. Tuckii*; Boschberg Mts., nr. Somerset East, C.P., 1876-78, *P. MacOwan & Tuck* (MacOwan 1225, S.A.M. 34318) 22050, Kew as *K. Tuckii*; Amabele, C.P., Jan. 1915, *P. v. d. Byl*, 8954; Grahamstown, Feb. 1915, *S. Schonland*, 8952, type of *K. Tuckii* var. *microcephala*, 8953; Kentani, *A. Pegler* 1424, 8848 as *K. Tuckii* var. *microcephala*, Kew; Umkomaas, Natal, April 1919, *V. Bottomley*, 11861; Malcomess, Knapdaar, C.P., April 1926, *Gideon Joubert*, 20842; Jacksonstun, Brits, Tvl., Nov. 1936, *A. O. D. Mogg*, 28730; Bathurst, C.P., April 1930, *B. Hahne*, 25367; Brenton, Knysna, *A. V. Duthie* 79, (E.L.S. 418) 31337; Bedford, C.P., *R. Marloth*, 26590; Umtata, *A. Abernethy*, Feb. 1940, 34148; nr. Bedford, C.P., Dec. 1879, *C. Trollip* (S.A.M. 31319); in sandy soil, Bellville, July 1939, *J. Lippett* (E.L.S. 553); Durban, *P. v. d. Byl* 359; Maciene, Mocambique, June 1928, *E. L. Stephens* 15; George, March 1934, *D. McIntyre* (E.L.S. 279); Pinelands, Capetown, June 1932, *E. L. Stephens* 129; nr. Melkbosch Strand, C.P., Aug. 1944 and 1945, *A. Salkeld*, a collection of 40 to 50 specimens (S.A.M. 56361); Barberton, Tvl., March 1941, *J. Rowland*, 32887.

Specimens not seen : Kentani, *Pegler* 1423, Kew; nr. Engcobo, Tambukiland, *Woolby*; Botanic Gardens, Durban, *Medley Wood*, Kew; Durban, *v. d. Byl* 359; Riversdale, C.P., *Muir* (v.d. *Byl* 2603); Krantskloof, Natal, *Medley Wood* 812 as *K. Tuckii*; Pungo Ondonga, Angola, Dec. 1856, *Welwitsch* 119; Bathurst, *B. Liebenberg*, Oct. 1930.

Although this plant varies considerably in size, number of cavities and processes in the clathrate dome and in the length and shape of the processes, it is easily recognised by its well developed stalk, which terminates in a brilliant, red, dome-shaped, clathrate structure, on which arise a number of concolorous, free, radiating, simple or apically branched or forked, coralloid processes. In collection No. 8848, one specimen is only 1.5 \times 1 cm. in size and has only a few obscure cavities and processes, the latter being little more than knob-like expansions of the cavity walls. In collection No. 8954 on the other hand, the processes were described by Dr. Pole Evans (l.c.) as "slender, tapering, and almost whip-like in appearance, instead of blunt and nail-shaped" (the preserved specimen is very much shrunk and no longer shows such extreme characters).

Kalchbrennera Tuckii v. *microcephala* was separated from the type, on the grounds of smaller size and short processes, but these characters vary so much in different collections that they are not considered of sufficient importance to constitute a separate variety.

K. Tuckii var. *Clathroides* described by P. Hennings (l.c.) as resembling a stalked *Clathrus* is probably a *Simblum*.

I am indebted to Miss Lewis of the South African Museum, Cape Town, for a full range of specimens of *K. corallocephala*, collected by Mr. A. Salkeld, showing all stages of development, as well as for some excellent coloured sketches. From these the above description was made.

SCLERODERMALES.

Plants usually finally epigeous, sessile or contracted into a stem-like base. Peridium of one, two or three layers, directly enclosing the gleba, dehiscing either by an apical pore or by irregular splitting, usually of the apical portion. Gleba without true capillitium threads, becoming pulverulent at maturity. Basidia 4-8-spored. Spores globose or elliptical, hyaline or coloured, smooth or rough, pedicellate or not.

The chief characters on which this order is separated from other orders are the absence of capillitium threads and the pulverulent nature of the mature gleba.

Cunningham included the two families CALOSTOMATACEAE and SCLERODERMATACEAE in this order, the former represented by a single genus, *Calostoma*, which has so far not been found in South Africa, and the latter by two genera, *Scleroderma* and *Pisolithus*, both of which commonly occur in this country. In the present work, the ARACHNIACEAE has likewise been included in this order, mainly on account of the important characters it has in common with the above two families, namely the absence of true capillitium threads and the pulverulent nature of the mature gleba. *Arachnion*, the only well-defined genus in the family, is fairly well represented in South Africa.

Key to the Families.

- | | |
|--|-----------------------------|
| Peridium borne on a well developed stem-like base, 3-layered, dehiscing by an apical pore. Gleba at maturity carried within the endoperidium, which is attached to the apex of the peridium..... | (<i>Calostomataceae</i>). |
| Peridium sessile or with a stem-like base, 1-2-layered, dehiscing by irregular splitting of the apical portion. Gleba at maturity pulverulent, free within the peridium or in small chambers formed by persistent tramal plates..... | Sclerodermataceae. |
| Peridium sessile, 1-layered, dehiscing by disintegration of the apical portion. Gleba at maturity pulverulent, consisting of peridioles lined with a hymenial layer, to which the spores are attached..... | Arachniaceae. |

SCLERODERMATACEAE Fischer.

Natürlichen Pflanzenfamilien 1, 1** (1900) 334.

G. H. Cunningham, *Gastero*. (1944) 115.

Plants usually epigeous, seldom entirely or partly subterranean, more or less globose, sessile or with a stem-like, rooting base. Peridium of one or two layers, dehiscing by irregular splitting of the apical portion. Gleba finally pulverulent, consisting of a mass of spores permeated by tramal plates, which either break down and become pulverulent or form the persistent walls of small chambers enclosing a mass of spores. Capillitium wanting. Spores usually globose, coloured, echinulate or reticulated. Basidia 2-8-spored.

Two genera only are included in this family—*Scleroderma* and *Pisolithus*—both of which are common in South Africa. They are separated from each other mainly on the following characters :—

- | | |
|--|------------------------|
| Tramal plates of the gleba permeating the mass of spores but finally breaking down and with the spores forming a pulverulent mass..... | 1. Scleroderma. |
| Tramal plates forming persistent walls of small chambers which enclose masses of finally pulverulent spores..... | 2. Pisolithus. |

1. SCLERODERMA Persoon.

Synopsis Methodica Fungorum (1801) 159, pro parte, emended Fries, *Systema Mycologicum* 3 (1829) 44.

Fischer, *Nat. Pflanz.* 7a (1933) 36 ; Verwoerd, *Ann. Univ. Stell.* 3 (1925) 17 ; G. H. Cunningham, *Gastero*. (1944) 114.

Sclerangium Lév., Ann. Sci. Nat., ser. 3, 9 (1843) 132.

Stella Mass., Journ. Myc. 5 (1890) 185.

Nepotatus Lloyd, Myc. Writ. 7, Myc. Notes 75 (1925) 1355.

Type species: *Scleroderma aurantium* Pers.

Plants globose, subglobose, depressed globose, pyriform, usually epigeous at maturity, sessile or contracted into a small to well-developed, stem-like base, attached by a mass of mycelial threads. Peridium smooth, areolate, squamose or warted, thick or thin. Gleba consisting of a mass of spores permeated by tramal plates, which finally become pulverulent. Spores coloured, large, globose or sometimes subglobose, usually strongly echinulate or less often reticulated.

Of the sixty or more species described for this genus, Cunningham (l.c., p. 110) considers that not more than about a dozen are good, the others being either synonyms of these or of *Mycenastrum*, with which *Scleroderma* has often been confused. About a dozen species have been recorded for South Africa and of these four have been definitely established as being distinct species. Several other species described or recorded may be distinct, but further study and comparison of specimens is necessary. This is rendered difficult by the terms of bequest of the van der Byl collections, under which specimens may not be removed from his herbarium.

Key to the Species.

Spores echinulate.

Dehiscence by irregular cracking of the apical portion.

Peridium typically smooth or becoming apically areolate or squamose... 1. *S. cepa*.

Peridium typically covered with dark, evenly distributed squamules or scales..... 2. *S. verrucosum*.

Dehiscence by splitting into several segments from the apex downwards, in a stellate manner. Stemlike base usually well developed..... 3. *S. flavidum*.

Spores reticulated.

Dehiscence by irregular cracking of the apical portion.

Peridium hard and woody when dry..... 4. *S. aurantium*.

Peridium thin, pliant and brittle when dry..... 5. *S. bovista*.

Dehiscence by splitting into several segments, from the apex downwards, in a stellate manner..... 6. *S. geaster*.

1. *Scleroderma cepa* Persoon. [Plate XXVIII, fig. 1; Plate XXIX, fig. 1.]

Synopsis Methodica Fungorum (1801) 706.

Verwoerd, Ann. Univ. Stell. 3 (1925) 18; Coker & Couch, Gastero. (1928) 167.

Plants 1-8 cm. diam., subglobose, depressed globose, pyriform, irregularly compressed when caespitose, sessile or nearly so, attached by a mass of white mycelial threads. *Peridium* Pinkish Buff, pale brown, ochraceous (between Honey Yellow and Olive Ochre), usually smooth when fresh, often becoming squamose or areolate, or occasionally warted in the apical part, the squamules inherent and almost concolorous, rather thick at first, drying to 1 mm. or less, finally leathery, rather brittle but not very hard, not discolouring to any extent when cut; sterile base if present, scanty, becoming yellowish when cut; dehiscing by irregular splitting in the apical portion. *Gleba* watery white at first, but soon nearly black with a violet tinge, finally olivaceous grey or stone grey with a violaceous tinge. *Tramal Plates* yellow or greyish. *Spores* globose or less often subglobose, strongly and long echinulate, 10.2-15.3 μ diam., common size 11.9-13.6.

Habitat: under trees, hedges and in open places, solitary, gregarious or caespitose.

Distribution: South Africa; North America.

Specimens examined : under *Populus* spp., Fountains Valley, Pretoria, March 1936, K. Lansdell & A. M. Bottomley, 28587, N. Parkes, 21095, March 1927, L. Reinecke, 21215 ; Wonderboom, Pretoria, Nov. 1936, E. M. Doidge & A. M. Bottomley, 28725, Jan. 1917, H. V. King, 10056, Feb. 1928, E. M. Doidge, 23168 ; Mazelspoort, Bloemfontein, May 1945 P. H. B. Talbot, 35402. Under *Pinus* spp., Meintjes Kop, Pretoria, March 1921, A. M. Bottomley, 14514, March 1925, 20389 ; Pretoria, April 1930, M. Bosman, 29436. Under *Salix* spp., Pyramids, Pretoria, Feb. 1939, A. Hean, 30999 ; Garstfontein, Pretoria, April 1911, P. J. Pienaar, 1338, 1349. Under *Eucalyptus* spp., Pretoria, Jan. 1928, L. Reinecke, 23141. Under *Quercus* spp., Belvidere, Knysna, A. V. Duthie, 31388 ; attached to roots of *Quercus* seedling, Johannesburg, March 1936, Superintendent of Handicrafts, 28585. Under hedge, Riviera, Pretoria, April 1945, E. Schaefer, 35401, Feb. 1946, 35400. Situation not indicated, Riviera, Pretoria, May 1916, L. Kresfelder, 9794, 9774 ; Rietfontein, Pretoria, April 1921, L. Venter, 14493 ; Pretoria, Jan. 1919, E. M. Doidge, 11810 ; Johannesburg, Dec. 1914, A. M. Bottomley, 8771 ; East Rand, G. Marquardt, 14485 ; Pietermaritzburg, Natal, April 1911, I. B. Pole Evans, 1342, 1343, 1347, 1356, 1358 ; Empangeni North, Natal, June 1917, P. v. d. Byl (N.H. 672), 31886 ; Mamathes, Basutoland, Feb. 1941, A. Jacot-Guillarmod, 33495 ; Aliwal North road, Jan. 1946, R. A. Dyer, 33518 ; Stellenbosch, C.P., Duthie 274 (v. d. Byl 1967 as *S. vulgare*) 31447 ; Oct. 1945, M. P. de Vos ; A. V. Duthie § 39, 31517 ; The Flats, Stellenbosch, June 1921, A. V. Duthie, 31469 ; Ida's Valley, Stellenbosch, Nov. 1924, A. V. Duthie, 35407 ; Knysna, C.P., A. V. Duthie, 31401, Jan. 1921, A. V. Duthie, 35403, Duthie 111, 31354 ; Toise River, C.P., March 1912, P. J. Pienaar, 2276 ; Kirstenbosch, C.P., June 1929, Prof. Compton, 24835, June 1921, V. A. Putterill, 14835, Jan. 1939, E. L. Stephens 431, 35514, April 1939, E. L. Stephens 468, 35440, May 1938, A. J. Middlemost (E. L. Stephens 467) 35515, April 1939 (E. L. Stephens 477) 35517 ; Rondebosch, E. L. Stephens 154, 35512 ; Stikland, C. P., March 1932, J. Acocks (E. L. Stephens 112) 35511 ; without locality, E. L. Stephens 470, 35516 ; Zululand, P. v. d. Byl 556 ; Natal, v. d. Byl 288 ; Nottingham Road, Natal, v. d. Byl 557 ; Stellenbosch, v. d. Byl 810, 812, Aug. 1922, v. d. Byl 893 ; Salisbury, S. Rhodesia, April 1926, Eyles 4091 (S.Rh. 3834).

Specimens not seen : University grounds, Rosebank, various dates, E. L. Stephens 78, June 1931, E. L. Stephens 79, May 1940, E. L. Stephens 524 ; in greenhouse, April 1941, E. L. Stephens 559 ; Brackenfel Hill, May 1932, J. Acocks (E. L. Stephens 118).

This species appears to be the most common so far encountered in South Africa. It is recognised by the usually smooth surface, the lack of, or scanty stem-like base and the comparatively thin mature peridial wall.

2. *Scleroderma verrucosum* (Bulliard ex Persoon) Persoon.

[Plate XXVIII, fig. 2 ;
Plate XXIX, fig. 2.]

Synopsis Methodica Fungorum (1801) 154.

Sacc. Syll. Fung. 7 (1888) 136 ; Verwoerd, Ann. Univ. Stell. 3 (1925) 18 ; G. H. Cunningham, Gastero. (1944) 119.

S. areolatum Ehrenb., Sylv. Myc. Berol. (1818) 27.

S. pandanaceum F. v. Muell., ex Berk. Journ. Linn. Soc. 13 (1872) 171.

S. Bresadoliae Schultz, Hedwigia 23 (1884) 163.

S. Torrendii Bres., Atti I.R. Acc. Sci. 8 (1902) 132.

Plants 1–8 cm. wide, up to 4.5 cm. high exclusive of the stem-like base, subglobose, depressed globose, pyriform or irregularly compressed if caespitose, abruptly contracted below into a well developed, lacunate, furrowed or smooth stem-like base, which is attached to the substratum by a mass of mycelial threads. *Peridium* Pinkish Buff, pale brown, pale ochraceous, yellowish brown, bay brown or umber, typically covered with brown

squamules or flattened warts; squamules or warts small to 2 mm. diam., fairly closely and more or less evenly distributed, darker brown than the peridium, usually larger in the basal half and sometimes slightly sunk in more or less well defined areolae; dehiscing by a small, torn, apical aperture, which splits irregularly in different directions. *Stem-like base* small to larger than the fertile part, in the latter case thick, solid, white, remaining unchanged or turning pinkish brown when cut, thin, becoming less than 0.5 mm. when dry, in section white at first, becoming pinkish brown when dry. *Gleba* white, soon turning sooty black with a violet tinge, finally stone grey, greyish brown, with or without an olivaceous tinge. *Tramal plates* white, then greyish and inconspicuous in the mature mass. Spores 8.5-13.6 μ diam., occasionally up to 17 μ diam., globose, coarsely and densely echinulate, dark greyish brown, mixed with hyphal remains.

Habitat: under trees, hedges or in the open, solitary, gregarious or caespitose.

Distribution: North and South Africa; Asia Minor; Australia; Britain; Europe; India.

Specimens examined: under *Populus* sp., Garstfontein, Pretoria, Feb. 1919, *E. M. Doidge*, 30702; Fountains, Pretoria, Feb. 1928, *E. M. Doidge*, 35406, March 1936, *A. M. Bottomley* & *K. A. Lansdell*, 35405; under hedge, Pretoria, Feb. 1946, *E. Schaefer*, 35404 Pietermaritzburg, Natal, April 1911, *I. B. Pole Evans*, 1345, Kew, Feb. 1915, *J. M. s im*, 8816; Stellenbosch, May, *A. V. Duthie* 13 (v. d. Byl 1185) 31300. Under *Quercus* p., Belvidere, Knysna, C.P., *A. V. Duthie* 212 as *S. tenerum* B. & C., 31369, Jan. 1921, *A. V. Duthie* 278 as *S. tenerum*, 31451; Mamathes, Basutoland, Feb. 1941, *A. Jacot-Guillermod* 33496; Kirstenbosch, March 1932, *E. L. Stephens* 107.

Specimens not seen: Salisbury, S. Rhodesia, *F. Eyles* 4141; Hogsback, N. J. G. Smith, Kew; Capetown, *MacOwan*, Kew.

This species is recognised by the thin, pale brown or yellowish, peridial wall, covered with small, evenly distributed, darker brown squamules or flattened warts. The dark brown scales against the paler background make a striking contrast.

3. ***Scleroderma flavidum*** Ellis et Everhart. [Plate XXX, fig. 1-2; Plate XXXI, fig. 3.]
Journal of Mycology 1 (1885) 88.

Coker & Couch, Gastero. (1928) 162; Verwoerd, Ann. Univ. Stell. 3 (1925) 17; G. H. Cunningham, Gastero. (1944) 120.

Scleroderma caespitosum Lloyd., Myc. Writ. 7, Myc. Notes 67 (1922) 1159.

S. flavidum var. *fenestriatum* Clel. & Cheel., Trans. Roy. Soc. S. Aus. 47 (1923) 75.

S. rhodesica Verwoerd, S.A. Journ. Sci. 23 (1926) 292.

Plants, unexpanded 1.5-6 cm. diam., expanded 2.5-14 cm. diam., subglobose, depressed globose, pyriform, smooth or plicate below, usually contracted into a well developed stem-like base. *Peridium* up to 5 mm. thick becoming much thinner when dry, hard, tough, woody, usually smooth to areolate at the apex or cracking into flattened warts, bright or dull ochraceous yellow, often becoming darker with age; usually dehiscing by irregular splitting, from the apex downwards, into 5-11 unequal or subequal lobes, which remain erect, with or without recurved tips, or become expanded in a stellate manner with recurved tips. *Gleba* olivaceous, finally umber, ochraceous brown, often disappearing completely at maturity, leaving the cup-shaped peridium empty. *Tramal plates* yellow, finally greyish and inconspicuous. Spores globose, densely echinulate, 7-12 μ diam.

Habitat: on the ground.

Distribution: Africa; North America; Australia; New Zealand.

Specimens examined : Potchefstroom, March 1939, *M. Gunn*, 30513; Meintjes Kop, Pretoria, April 1925, *A. M. Bottomley*, 20414; Parys, O.F.S., April 1936, *E. M. Doidge*, 28601; without locality, *E. L. Stephens* 223, 34530; Stellenbosch, Oct. 1945, *M. P. de Vos*; Rietvlei, Pretoria, March 1945, *A. M. Bottomley*, 35399; Magaliesberg Mts., Rustenburg, June 1928, *W. Dobie*, 23380; Riviera, Pretoria, May 1916, *L. Kresfelder*, 9773; Mooibank, Potchefstroom, Nov. 1929, *H. A. Lawrence*, 24885; Fountains Valley, Pretoria, March 1924, *A. M. Bottomley*, 20466; Kirstenbosch, C.P., June 1929, *K. A. Lansdell*, 24824; Meintjes Kop, Pretoria, May 1925, *A. M. Bottomley*, 20583; under *Eucalyptus* trees, Potchefstroom, July 1935, *J. Sellschop*, 28516, April 1925, *M. Radloff* (v. d. Byl 2093); Under *Pinus* sp., Stellenbosch, June 1924, *L. Verwoerd* (Stell. 9; v.d. Byl 1966); on ground, Kirstenbosch, June 1924, *L. Bolus* (v. d. Byl 1668); on ground, Pietersburg, Tvl., April 1930, *I. B. Pole Evans*, 25424; on banks of Umsinduzi River, Pietermaritzburg, April 1911, *I. B. Pole Evans*, 1555; Salisbury, S. Rh., *F. Eyles* 4133 (S. Rh. 4030) co-type *S. rhodesica* Verwoerd.

Specimens not seen : Klein Drakenstein, v. d. Byl 2543; Bloemfontein, Verwoerd.

This species is recognised by the yellow colour, usually smooth, sometimes apically areolate, relatively thick, hard peridial wall, stellate manner of dehiscence and often finally empty peridium, due to the disappearance of the gleba. It differs from *S. geaster*—a species not so far definitely established as occurring in South Africa—which dehisces in a similar manner, in its usually smaller size, smoother peridium and the larger spores with longer spines and no reticulum.

4. *Scleroderma aurantium* (Vaillant) Persoon. [Plate XXXI, fig. 2.]

Synopsis Methodica Fungorum (1801) 153.

Hollós, Gastero. Ung. (1904) 131; Coker & Couch, Gastero, (1928) 168.

Lycoperdon cervinum Bolton, Fung. Fasc. III (1799) 39.

Scleroderma vulgare Hornem. Flora Dan. (1829) t. 1969; Verwoerd, Ann. Univ. Stell. 3 (1925) 18.

S. citrinum Pers., Syn. Meth. Fung. (1801) 153.

S. squamosum Chev., Flor. Paris (1826) 357.

Plants 1.5–5 cm. diam., epigeous, depressed globose, contracted or pinched below into a small or large stem-like base, which is attached to the substratum by a mass of mycelial threads. *Peridium* hard and woody when dry, about 2 mm. thick when fresh, drying to about 0.5 mm., yellow, ochraceous or pale brown, smooth or apically simply areolated, or areolated with central warts or finely or grossly warted; dehiscing by irregular cracking of the apex. *Gleba* chocolate brown, olivaceous umber, violaceous grey. *Tramal plates* white, then yellow or greyish, usually conspicuous. *Spores* globose, dark brown, reticulated, 13.6–17.0 μ diam., including the reticulations, the tips of which are connected by an entire or broken hyaline halo. In the latter case, the edges of the reticulations, seen under the microscope as long spines around the spore, appear to be apically branched.

Habitat : on ground, solitary.

Distribution : North and South Africa; North America.

Specimens seen : Kloof, Natal, April 1940, *Dr. Bonfa*, 33571; Nottingham Road, Natal, April 1917, *P. v. d. Byl* (N.H. 538) 31805.

Specimens not seen : Bloemfontein, *L. Verwoerd*; Salisbury, *Eyles* 409 (v. d. Byl 2351); Cape, *MacOwan* 1454, Kew,—all as *S. vulgare*.

The above description is based on two collections only. These specimens differ from the typical form occurring elsewhere in the surface of the peridium and in the size of the spores. They are smooth or wrinkled instead of covered apically with warts or scales and the spores are larger than those of the European and North American plants, being $13.6-17.0\ \mu$ including the reticulations, instead of $8.5-10.2\ \mu$ recorded by Coker & Couch (l.c.) or $9.5-13\ \mu$ mentioned by Hollós (l.c.). These differences do not appear to justify a new species, especially as the spores are typically reticulated, a rather unusual feature.

The species is recognised by the yellow colour, the hard, thick peridial wall, and particularly the reticulated spores.

5. *Scleroderma bovista* Fries.

Systema Mycologicum 3 (1829) 48.

Hollós, Gastero. Ung. (1904) 133; Coker & Couch, Gastero. (1922) 164; G. H. Cunningham, Gastero. (1944) 117.

S. texense Berk., Lond. Journ. Bot. 4 (1845) 308.

S. columnare Lloyd, Myc. Notes (1918) 759.

Plants 0.7-2 cm. diam., subglobose, depressed globose or irregular by pressure when caespitose, sessile or almost so, pinched below into a dense mass of whitish mycelial threads. *Peridium* becoming thin and brittle at maturity, ochraceous brown, bay brown or umber, smooth or becoming apically finely areolated, dehiscence by irregular cracking at the apex. *Gleba* ochraceous to olivaceous. *Tramal plates* yellowish, more or less persistent, the fragmented plates often resembling poorly developed capillitium threads. *Spores* globose, olivaceous to olivaceous-brown, $10-14\ \mu$ diam., coarsely reticulated, the reticulations projecting at the margin like blunt, finger-like processes, usually partly, if not entirely connected by a hyaline halo.

Habitat: solitary or caespitose in ground.

Distribution: South Africa; North America; Australia; Europe; India; New Zealand.

Specimens examined: in manured flower garden, Salisbury, S. Rhodesia, Jan. 1939 (S.R.M.H. 4277).

The species is characterised by its thin, pliant but brittle peridium, more or less persistent tramal plates and coarsely reticulated spores. It differs from *S. aurantium* mainly in the texture of the peridium which in the latter case is hard and woody.

Doubtful or insufficiently known Species.

Scleroderma capensis Lloyd.

Mycological Writings 7 (1924) 1305.

Plants small, 6-15 mm. diam., subglobose, sessile, attached by a mass of fine mycelial threads. *Peridium* ochraceous brown, smooth to minutely cracked and roughened, thin and brittle. *Gleba* reddish brown. *Tramal plates* yellow, becoming inconspicuous in mature gleba. *Spores* globose, strongly echinulate, $8.5-13.6\ \mu$, common size $10.2\ \mu$, free of hyphal debris.

Habitat: in clayey soil, largely subterranean.

Distribution: South Africa.

Specimens examined : Stellenbosch, *Duthie* 327 (Lloyd Myc. Coll. 24894, Type) 31489, part of type collection.

This species, of which only three specimens are available for examination, resembles a small *Scleroderma cepa* with reddish brown gleba and usually smaller spores. Since both these characters are variable, there do not seem sufficient grounds on which to erect a new species. Further collections are necessary to settle this point. Lloyd (l.c.) advanced no sound reasons for his new species. He names the small size, different appearance of the gleba and freedom of the spores from hyphal remains as the differences between this species and others.

Scleroderma laeve (Léveillé nom. nud.) Lloyd.

Lloyd, Mycological Writings 5, Letter no. 63, Note 468 (1916) 11.

Lloyd (l.c.) writes in connection with the only South African record of this species :—

"*Scleroderma laeve* from Miss A. V. Duthie, South Africa. The name is based on a specimen so named by Léveillé, at Paris, which never broke into print. As to shape, rooting base and thin peridium it corresponds to *Scleroderma verrucosum* but has a smooth peridium. In my opinion it is a smooth form of *Scleroderma verrucosum*."

No specimen is available for examination and it is therefore not possible to make any comment on the above note. If, as Lloyd suggests, the specimen, *Duthie* 118, is a smooth form of *S. verrucosum*, the case is parallel with that of the South African form of *S. aurantium*, which is smooth to wrinkled, whereas the typical form found elsewhere is rough.

Scleroderma lejospermum (Montagne) de Toni.

Saccardo Sylloge Fungorum 7 (1888) 140.

Mycenastrum lejospermum Mont., Enum. Fung. (1847) 175 ; Sac. Syll. Fung. 7 (1888) 140.

Peridium . . . *Capillitium* colour of powdered rhubarb. Spores quite smooth, brown, hyaline, shortly pedicelled, containing an oil drop occupying almost half of the diameter. (Description from Saccardo of *Mycenastrum lejospermum* Mont.)

Habitat : in dry places.

South African record : Witpoortberg, S. Africa, *Drege* 9466.

It is very unlikely that the specimen on which this record was based was either a *Mycenastrum* or a *Scleroderma*, since neither of these genera has smooth spores. In the absence of a description of the peridial characters it is impossible to suggest what genus, much less species, it could be. No specimen is available for examination.

Scleroderma pyramidatum Kalchbrenner.

Grevillea 10 (1882) 109.

"Globosum (2 poll. et ultra diam.) brevissime stipitatum, areolatum, areolis elevatis pyramidulas truncatas formantibus. Sporae (?) . . . Sterile sed areolis pyramidatis insigne" (Kalchbrenner l.c.).

South African record : on the ground, Natal, *Medley Wood* 375, 10704.

Medley Wood's collection is apparently the only record of this species ; it is not a *Scleroderma*, but a gill fungus, thought to be *Montagnites* ; as it is quite immature no more exact identification can be made.

Scleroderma stellenbossiensis Verwoerd.

South African Journal of Science 23 (1926) 292.

Peridium 0.2–5.0 cm. diam., epigeous, more or less globose, with an irregular stem-like base 1–4 cm. long, single, rather thick, smooth, dingy with a purplish tinge when fresh, dehiscing by splitting into four irregular segments. *Gleba* white, later purplish. Spores globose, 7.2–10.8 μ , strongly echinulate, brown. (Description ex Verwoerd, l.c.)

Habitat : on damp clayey ground.

Distribution : South Africa.

South African Record : Stellenbosch, C.P., *L. Verwoerd* 300 (Stell. 2223).

A hurried examination of specimens of the above collection suggested that the species is very close to *S. verrucosum*. The only difference appears to be the smooth instead of rough peridium. It may be the same as Dr. Duthie's specimen No. 118, also collected at Stellenbosch, which Lloyd called *S. laeve*, remarking that, in his opinion, it was a smooth form of *S. verrucosum*. A further, more critical examination of Verwoerd's specimens is necessary before any further comment can be made.

Scleroderma tenerum Berkeley.

in Cooke, Cuban Fungi, No. 512.

Specimens not seen : along edge of stream, Belvidere, Knysna, *Duthie* 141 ; inside decayed tree, Stellenbosch, *Duthie* 119.

Five collections of this species have been recorded for South Africa. Of these *Duthie* 212 and *Duthie* 278, 31451, collected at Knysna, are considered to be a form of *S. verrucosum* ; the other two *Duthie* collections have not been seen. Judging from the spores, not mentioned in the original description of *S. tenerum*, v. d. *Byl* 619 appears to be something different. The spores are smooth or obscurely verrucose, pale ochraceous and the average size 4 μ diam. Other characters are : *Peridium* 1.2–1.4 cm. wide, 0.8–1 cm. high, ochraceous, cracking into small, closely set, flattened verrucae, prolonged into a thick, acuminate rooting structure. *Gleba* ochraceous. The van der Byl specimen should be more critically examined.

2. **PISOLITHUS** Albertini et Schweinitz.

Conspectus fungorum in Lusatae Superiores (1805) 82.

G. H. Cunningham, *Gastero.* (1944) 121 ; Verwoerd, *Ann. Univ. Stell.* 3 (1925) 16.

Ed. Fischer in *Nat. Pflanz.* 7a (1933) 39.

Polysaccum DC et Desp., *Rapp. voy. bot. l'Ouest Fr.* 1 (1807) 8.

Pisocarpium Link, *Mag. Ges. nat. Freunde* 3 (1809) 33.

Durosaccum Lloyd, *Myc. Writ.* 7 (1924) 1306.

Type Species : *Pisolithus tinctorius* (Mich. ex Pers.) Coker & Couch.

Plants consisting of a peridium supported on a well developed rooting base. Peridial wall of one layer only, which is thin, membranous and brittle. Dehiscence by the breaking into segments of the upper part of the peridial wall, exposing the finally pulverulent gleba. Gleba divided into subglobose or polygonal spore-bearing cavities—the peridioles—which are separated by persistent walls—the tramal plates—on which the basidia and spores are borne. Capillitium absent. Spores globose, echinulate, coloured. Basidia pyriform, bearing 2–6 spores on short sterigmata.

The characteristic features of this genus are the 1-layered peridial wall, the division of the gleba into cavities separated by persistent walls and the absence of capillitium threads. It differs from *Scleroderma* in having persistent tramal plates.

Owing to the great variation shown by this plant, numerous different species have been described for it, but it is considered by Cunningham and others that there are at most three good species, viz. *P. tinctorius*, *P. microcarpus* and *P. Boudieri*. Of these only *P. tinctorius* is known to occur in South Africa. *P. microcarpus* is found in Australia and *P. Boudieri*, if distinct from the first named, is found in Corsica.

Pisolithus tinctorius (Micheli ex Persoon) Coker & Couch. [Plate XXXII, fig. 1, 2.]

Gasteromycetes of the Eastern United States and Canada (1928) 170.

G. H. Cunningham, Gastero. (1944) 122.

Scleroderma tinctorium (Mich.) Pers., Syn. Meth. Fung. (1801) 152.

Pisolithus arenarius Alb. & Schw., Conspectus (1805) 82.

Polysaccum crassipes DC. & Despr., Rapp. bot. Fr. 1 (1807) 82; Sacc. Syll. Fung. 7 (1888) 146; van der Byl, Trans. Roy. Soc. S. Afr. 6 (1918) 209; Verwoerd, Ann. Univ. Stell. 3 (1925) 16.

P. acaule DC., Fl. Fr. 5 (1815) 103.

Pisocarpium clavatum Nees, Syst. Pilze (1817) 138.

Polysaccum herculeum (Pers.) Fr., Syst. Myc. 3 (1829) 52.

P. turgidum Fr., l.c., p. 53.

P. olivaceum Fr., l.c., p. 54.

P. pisocarpium Fr., l.c.

P. tuberosum (Mich.) Fr., l.c., p. 55.

P. conglomeratum Fr., l.c.

P. arenarium (Alb. & Schw.) Corda, Icon. Fung. 2 (1838) 24.

P. tinctorium Mont., Phyto. Canariensis (1840) 87.

P. australe Lév., Ann. Sci. Nat. Ser. 3, 9 (1848) 136.

P. leptothecum Reich., Reise Oesterr. Novara um d. Erde 1 (1879) 134.

P. marmoratum Berk., Journ. Linn. Soc. 13 (1972) 155.

P. boreale Karst., Not. Faun. et H. Fenn., 8 (1882) 203.

Scleroderma umbrinum Cooke & Mass., Grev. 19 (1890) 45.

Polysaccum album Cooke & Mass., Grev. 20 (1891) 36.

P. pisocarpium var. *novo-zelanica* P. Henn., in Engl. Bot. Jahrb. 18 (1894) 37.

Pisolithus tinctorius (Mont.) Fisch., Nat. Pflanz. 1 (1900) 338.

P. australe (Lév.) Fisch., l.c.

Polysaccum pusillum Pat. & Har., Journ. de Bot. 17 (1903) 13.

P. umbrinum (Cooke & Mass.) Lloyd, Myc. Writ. 1, Lyc. Aus. (1905) 13.

Pisolithus Kisslingi Fisch., Mitt. Nat. Ges. Bern. 10 (1906) 10.

Polysaccum pygmaeum Lloyd, Myc. Writ. 7 (1924) 1306.

Plants up to 20 cm. tall, 17 cm. broad, solid and firm when young, variable in shape—subglobose, pulvinate, broadly oval, pyriform, mature specimens often irregularly lobed due to the splitting of the peridium when maturing, usually narrowing gradually, or often suddenly into a stout, often irregular rooting base, which is attached to the substratum by

yellowish rhizomorphic strands. *Peridium* 1-layered, thin, brittle, finally cracking in the upper part into segments, which fall away, exposing the disintegrating, finally pulverulent gleba, smooth or occasionally rugulose, shining, ochraceous to bright yellow at first, especially towards the base, becoming greyish brown to blackish or grey with brown (Vandyke brown) markings, producing a snake skin effect. Rooting base yellow to yellowish or dark brown, at first of an indiarubber-like texture within, later hard and woody. *Gleba* divided into subspherical, broadly oval or irregular polygonal cavities—the peridioles—1–4 mm. long, 1–2 mm. wide, separated by persistent walls—the tramal plates—which are thick, black, wet and of indiarubber texture at first, but finally become dry and pulverulent and olivaceous brown or umber in colour. In the young plant, the whitish spore-filled peridioles, with their dark partitions, produce a characteristic mottled effect. *Capillitium* threads wanting. *Spores* globose, strongly echinulate, 5–8.5 μ diam., borne on the tramal plates lining the cavities, olivaceous brown.

Habitat : in sandy, gravelly or hard, stony soil ; solitary or caespitose, usually under, or in the vicinity of *Eucalyptus* trees.

Distribution : South Africa ; North America ; Australia ; East Indies ; New Zealand ; Tasmania.

Specimens examined : Under *Eucalyptus* spp., Pretoria, May 1911, *I. B. Pole Evans*, 1560 ; Eloff's Cutting, Pretoria, *O. Weeber*, Sept. 1909, 959, Sept. 1911, 886 ; Zoo Cutting, Pretoria, *A. O. D. Mogg*, 23638 ; Meintjes Kop, Pretoria, May 1923, *S. Gower*, 17093 ; Pretoria-Johannesburg road, Sept. 1925, *K. Vos*, 20627, April 1939, *A. O. D. Mogg*, 30781 ; Groenkloof, Pretoria, April 1915, *J. Sellschop*, 8958 ; Buccleuch, Natal, Nov. 1916, *J. M. Sim*, 9792 ; Donnybrook, Natal, Feb. 1935, *K. E. Morgan*, 28950 ; Lobatsi, Bechuanaland. May 1923, *Wallace*, 17094 ; Trappe's Valley, Bathurst Distr., Sept. 1930, *R. A. Dyer*, 25495 ; Klappmuts, C.P., June 1929, *Dr. André*, 24842 ; Newlands, C.P., April, *A. V. Duthie* 123, 31358 ; Deepwalls, Knysna, Oct. 1923, *J. Phillips* (v. d. Byl 2325) 18040, Transvaal, Feb. 1919, *L. Kretschmar*, 11815 ; Maritzburg, Natal, *W. G. Rump* (v. d. Byl 2623) ; Pretoria, v. d. Byl 1965 ; Tzaneen, Tvl., July 1924, v. d. Byl 1474 ; Stellenbosch, v. d. Byl (Stell. 157) ; Elgin, C.P., *E. L. Stephens* 419 ; Somerset West, April 1940, *S. Garside* (*E. L. Stephens* 508). Numerous other collections have been recorded from both the Cape and Transvaal Provinces.

Specimens not seen : Grahamstown, *N. J. G. Smith*, Kew ; nr. Solheim M.S., Eshowe, *Hpeg* 170 ; Potchefstroom, *Radloff* (v. d. Byl 2092).

The distinguishing features of this plant are the single layered peridial wall, the division of the gleba into cavities separated by permanent walls and the absence of capillitium threads.

This plant is commonly known in South Africa as *Polysaccum crassipes*, but, in accordance with the International Rules of Botanical Nomenclature, this name must give way to the earlier one of *Pisolithus tinctorius*. It is widely distributed throughout the country and very common some seasons ; as far as our experience goes, it is usually, if not always found in association with *Eucalyptus* trees, on the roots of which rhizomorphic strands of the fungus may form yellowish masses. Van der Byl (l.c.) who investigated the relationship between *Eucalyptus* trees and the fungus, came to the conclusion that it was one of symbiosis. Miss E. L. Stephens of Cape Town University records the occurrence of this fungus in the Cape Peninsula under Myrtaceous hedges. In this connection, van der Byl (l.c.) mentions that *Bruns* found *Polysaccum* forming coatings on the roots of pines, but no other reference to a possible symbiotic relationship between this fungus and any other plant has been noted.

As the specific name suggests, *Pisolithus tinctorius* contains a bright olivaceous yellow dye, which permanently stains cotton and woollen goods and paper.

ARACHNIACEAE Coker & Couch.

Gasteromycetes of the Eastern United States and Canada (1928) 144; Verwoerd, Ann. Univ. Stell. 3 (1925) 19.

Plants epigeous, subglobose, sessile. Peridium 1-layered, very thin, fragile, disintegrating at maturity. Gleba consisting of distinct chambers or peridioles, which finally crumble and form a mass of minute, separable, hollow bodies resembling grains of sand; peridioles lined with a hymenial layer on which the spores are borne. Capillitium lacking. Spores small, globose or subglobose, smooth, pedicellate or not.

This family contains but one well defined genus, namely *Arachnion*, which consists of small, delicate plants resembling small Lycoperdons without the apical stoma. The systematic position of the family is uncertain and has given rise to conflicting opinions. According to Coker and Couch (l.c.) it is most nearly related to the Lycoperdaceae, but differs in having a 1-layered peridium, in the absence of capillitium threads and presence of peridioles; they do not, however, suggest where they consider it should be placed. Fischer (Nat. Pflanzen. 7a, 1933: 55) places it in the Nidulariineae on account of the presence of peridioles, Verwoerd (l.c.) places it in the Sclerodermataceae. Cunningham expresses no opinion on the matter, presumably because the family is not represented in the areas worked by him. However, following Cunningham's interpretation of the various families, as expressed in his general classification, the Arachniaceae seems to fit best in the order Sclerodermatales, since the gleba becomes pulverulent at maturity and lacks capillitium threads, the two characters on which this order is separated from other orders. This arrangement has therefore been followed.

ARACHNION Schweinitz. p. 505

Synopsis Fungorum Carolinae superioris, Naturforschenden Gesellschaft 1 (1920) 20.

Scoleiocarpus Berk., Enum. Fung. coll. Herr Zeyher in Hooker's London Journ. Bot. 2 (1843) 420.

Type species: *Arachnion album* Schw.

Plants superficial, subglobose, with basal mycelial threads. Peridium thin, fragile, breaking up at maturity. Gleba consisting of numerous, closely compacted, globose or elliptical chambers, lined with a hymenial layer on the basidia of which the spores are borne. At maturity the chambers form a mass of minute, separable, hollow peridioles, which crumble and resemble grains of sand. Capillitium and sterile base lacking, Basidia 4-spored. Spores long pedicellate, smooth, globose or shortly elliptical.

This genus is characterised by its simple peridial wall, the absence of capillitium and the presence of peridioles lined with a hymenial layer.

Key to the Species.

Peridial wall smooth.

Spores pedicellate.

Plants 1-2.2 cm. diam., white, silver grey, buff. Gleba grey to greenish olive.....

1. **A. album.**

Plants 1-5-3 cm., originally pinkish. Gleba purplish, then greyish white.....

2. **A. alborosella.**

Plants 5-7 cm. diam., dark sooty coloured. Gleba ash grey.....

3. **A. giganteum.**

Spores not pedicellate.

Plants 1-3.5 cm. diam., white then grey. Gleba ash-coloured.....

4. **A. firmoderma.**

Peridial wall finely warted.

Spores pedicellate.

Plants 1-1.5 cm. diam., pale yellowish. Gleba greenish olive.....

5. **A. scleroderma.**

1. *Arachnion album* Schweinitz. [Plate XXXI, fig. 1.]

- Synopsis Fungorum Carolinae superioris, Naturforschenden Gesellschaft 1 (1820) 20
 Verwoerd, Ann. Univ. Stell. 3 (1925) 19; Coker & Couch, Gastero. (1928) 145.
Scoleciocarpus tener Berk., Hooker's Journ. Bot. (1843) 520.
S. bovista Mont., Ann. Sci. Nat. 3 sér. 11 (1849) 33.
Arachnion bovista Mont., l.c. 12 (1849) 302.
A. Drummondii Berk., Journ. Linn. Soc. 18 (1881) 389.

Plants superficial, subglobose, sessile, attached by a single rooting structure, 1-2·2 cm diam. *Peridium* white, silver grey or pale buff coloured, smooth, becoming wrinkled when dry, thin, fragile, breaking up when mature. *Gleba* white then grey, finally brownish-olive (nearest Deep Greyish Olive) composed of numerous empty chambers lined with a hymenial layer "apparently made up only of basidia, the context between the chambers consisting of a loose web of delicate, interwoven hyphae. At maturity, this loose tissue breaks down and leaves the chambers as distinct granular particles, which contain the spores and fall apart like sand at maturity or decay into a sordid mass in wet weather" (words in inverted commas ex Coker & Couch l.c.). *Spores* globose or subglobose, smooth, tinted brown, 3·6-4·5 μ diam., long pedicellate; pedicels thin, hyaline, up to 50·4 μ long, average size 18·0-25 μ .

Habitat: in open grassy places, under trees, in flower garden beds.

Distribution: South and East Africa; North and South America; Europe.

Specimens examined: Stellenbosch Flats, C.P., May and June, *Duthie* 21, 31303; Stellenbosch, June 1921, *Duthie* (E. L. Stephens 82a) 31506, 31507; Belvidere, Knysna, C.P., Dec. 1920, *Duthie* 68, 31330, Jan. 1919, *Duthie* 217, 31405; July 1919, *Duthie* 240, 31423; Forest Hall, Knysna, Feb. 1919, *Duthie* 219, 31407, *Duthie* 220, 31408; Feb. 1919, *Duthie* 222, 31410; Stellenbosch, L. Verwoerd (Stell. 172; v. d. Byl 1968); Mowbray, C.P., M. Levyns (v. d. Byl 2109); Pasture Research Station, Rietvlei, Pretoria, March 1945, A. M. Bottomley, 35432; Kalberg, C.P., Jan. 1939, E. L. Stephens 429.

Specimen not seen: locality unknown, E. L. Stephens 320, 398.

This species is recognised by its smooth, whitish peridium.

2. *Arachnion alborosella* Verwoerd.

South African Journal of Science 23 (1926) 291.

Plants 1·5-3·0 cm. diam., superficial, sessile, more or less globose, attached by a rooting strand. *Peridium* smooth, white, tinted with pink, which fades or altogether disappears from herbarium specimens, very thin, papery. *Gleba* purplish, becoming greyish white, consisting of small peridioles, irregular in shape and size and mixed with fungus tissue. *Spores* globose, 3·6-4·5 μ diam., very faintly tinted, smooth, pedicellate; pedicel rather thin and long.

Habitat: in veld.

Distribution: South Africa.

South African specimens: Brandfort, O.F.S., L. Verwoerd T234 (v. d. Byl 2221).

This species is characterised by the originally pink colour of the peridial wall. No specimens were available for examination.

3. *Arachnion giganteum* Lloyd.

Mycological Writings 5, Mycological Notes 46 (1917) 645.

Plants 5–7 cm. diam., globose, attached by a few mycelial threads. *Peridium* thin, fragile, smooth, dark fuliginous. *Gleba* resembling grains of sand, ash grey. *Peridioles* globose or oblong, rather firm, 200–400 μ diam. *Spores* globose, 8.0 μ diam., smooth, tinted without a pedicel.

Habitat : on ground.

Distribution : South Africa.

South African Specimens : Clanwilliam, *Duthie 166a* (Lloyd Myc. Coll. 22753); Stellenbosch, *Duthie 255* (Lloyd Myc. Coll. 50745); Belvidere, Knysna, *Duthie 254*.

This species is recognised by its large size and the absence of a spore pedicel. It was described by Lloyd from a specimen supplied by Dr. Duthie. Unfortunately no duplicate material was lodged in any herbarium in South Africa.

4. *Arachnion firmoderma* Verwoerd.

South African Journal of Science 23 (1926) 290.

Plants 1–3.5 cm. diam., superficial, sessile, more or less globose, sometimes broadly oval, with a thin rooting strand. *Peridium* smooth, white then grey, rather thick, firm, leathery, breaking up irregularly. *Gleba* ochraceous or ash coloured, consisting of small peridioles up to 1.5 mm. long diam. mixed with fungus tissue. *Spores* globose, 4.5–6.3 μ diam., Thick-walled, smooth, hyaline to tinted, often apiculate.

Habitat : on ground frequented by cattle.

Distribution : South Africa.

South African Specimens : Brandfort, O.F.S., *L. Verwoerd 233* (v. d. Byl 2220).

This species is said to differ from *A. album* in size, in the white, thicker and more permanent peridium and in the absence of spore pedicels. The material was not available for examination.

5. *Arachnion scleroderma* Lloyd.

Mycological Writings 4, Mycological Notes 39 (1915) 538.

Myc. Writ. 5, Myc. Notes 46 (1917) 644; Verwoerd, Ann. Univ. Stell. 3 (1925) 20

Plants 1–2 cm. diam., globose, subglobose, with a strong rooting base. *Peridium* thin, pale yellowish to ochraceous, smooth, clothed with small, irregular, closely set, caducous warts. *Gleba* olivaceous-grey, grey. *Peridioles* irregular both in size and shape, from globose to narrowly elongated or obtusely triangular, 60–300 μ diam. *Spores* globose or somewhat egg-shaped, smooth, subhyaline to pale olivaceous-brown, 3.4–4 μ diam., pedicellate or no; pedicels, when present, 5–20 μ long.

Habitat : in open places.

Distribution : South Africa.

Specimens examined : Flats, Stellenbosch, May, *Duthie 41* (E. L. Stephens 82 A & B; 31313; *Duthie 70* (van der Byl 1969; Lloyd, Myc. Coll. 22677, 22678) 31501; Johannesburg, Feb. 1946, *C. Cohen*.

Specimens not seen : Flats, Stellenbosch, *Duthie 232* (Lloyd Myc. Coll. 24892) Stellenbosch, *Verwoerd* (Stell. 183); locality unknown, *E. L. Stephens 217*.

This species is recognised by its warty peridial wall.

LYCOPERDALES.

Peridium finally superficial, originally attached to a substratum by mycelial threads, globose or variously shaped, sessile or stipitate, of one, two or more layers, dehiscing by an apical pore (occasionally several) or by the gradual breaking down of the upper portion or by circumscissile splitting of the endoperidium. Gleba pulverulent at maturity, consisting of numerous, simple or branched, hyaline or coloured capillitium threads. Spores hyaline or coloured, rough or smooth, globose, elliptical or occasionally irregular. Basidia 1-8-spored, cylindrical or clavate.

This is the largest order of the Gasteromycetes, including all those groups of fungi referred to in general as "Puff Balls". It is distinguished from other orders on the nature of the gleba, which consists of well-developed capillitium threads mixed with the spores and which becomes pulverulent at maturity.

The order is divided into two well-defined families—*Lycoperdaceae* and *Tulostomataceae*—separated from each other on the stem character. The former is either sessile or has only a stem-like base, while the latter has a true, well-developed stem.

LYCOPERDACEAE Corda.

Icones Fungorum 5 (1842) 22; emended G. H. Cunningham, Proceedings of the Linnean Society of New South Wales 57 (1932) 315.

G. H. Cunningham, Gastero. (1944) 124.

Peridium usually globose or subglobose, at least when young; attached to the substratum by mycelial threads, sessile or with a stem-like base of sterile tissue; wall consisting of one to four layers, dehiscing by a pore (occasionally several) or by the breaking away of the apical portion. *Capillitium* threads abundant, simple or freely branched, hyaline or coloured, varying in thickness. Spores globose or elliptical, usually roughened, but sometimes smooth. *Basidia* 1-8-spored, spores on sterigmata.

The *Lycoperdaceae* contains the true "Puff Balls" so called on account of the shape of the plants, which is typically ball-like—at least in the early stages—and the fact that the spores are ejected from the plant through the apical pore in puffs. *Lycoperdon*, which is the representative genus of the family and contains the largest number of species, is the typical puff ball plant.

Cunningham divides the *Lycoperdaceae* into three sections, or tribes as he calls them—*Mesophelliae*, *Lycoperdeae* and *Geastreae*—according to the number of layers in the peridial wall, the manner of dehiscence and the nature of the spores. In the *Mesophelliae* he places the genera *Mesophellia*, *Castoreum* and *Abstoma*; these genera are characterised by a three-layered peridial wall, the outer two layers of which form a brittle shell, unbranched capillitium threads, spores with a gelatinous exospore and dehiscence by disintegration of the whole plant. None of these three genera is known to occur in South Africa, and the *Mesophelliae* section is therefore excluded from the present work.

Key to the Genera.

A.—**Mesophelliae**.—c.f. general key for characteristics.

B.—**Lycoperdeae**.—Peridium 1-2-layered, dehiscing by an apical pore or by irregular rupture of the apex. Capillitium threads simple or freely branched. Spores typically globose and verrucose. Plants usually few, single or caespitose.

Capillitium threads without spines. Inner peridium membranous, thin, firm, or soon breaking up, seldom rigid and permanent.

Capillitium threads more or less smooth, without a thick main stem and thinner, short, pointed branches.

- Plants dehiscing by an apical pore.
- Capillitium threads attached to the endoperidial wall, long, simple or sparingly branched..... 1. **Lycoperdon.**
 - Capillitium threads free within the peridium, short, simple or branched..... 2. **Disciseda.**
- Plants dehiscing by rupture or disintegration of the apex.
- Capillitium pulverulent or compact. Sterile base usually present. Endoperidium usually thick, tough..... 3. **Calvatia.**
 - Capillitium compact. Sterile base lacking. Endoperidium thin, papery, brittle. Plants becoming detached at maturity..... 4. **Lanopila.**
 - Capillitium threads freely branched, consisting of a thick stem with sharp pointed, tapering, thinner branches.... 5. **Bovista.**
 - Capillitium threads spiny, short, free within the endoperidium. Endoperidial wall thick and corky..... 6. **Mycenastrum.**
- Plants numerous, borne on a common stroma, whole cluster covered by a universal exoperidium.
- Peridia separated from each other by alveolar walls..... 7. **Broomeia.**
 - Each peridium provided with an individual exoperidium, the cup-like remains of which separate the peridia from each other..... (*Diplocystis*).
- C.—**Geastreæ**.—Peridium 4-layered. Exoperidium splits into segments in stellate manner. Endoperidium dehisces by one or more pores or by rupture of the apex. Capillitium threads simple or branched. Spores typically globose and verrucose or echinulate.
- Plants dehiscing by a single apical pore..... 8. **Geastrum.**
 - Plants dehiscing by several apical pores..... 9. **Myriostoma.**
 - Plants dehiscing by rupture of the endoperidium from apex downwards.. 10. **Geasteropsis.**

Lycoperdeæ.

Peridium usually of two layers, the outer or exoperidium often reduced to granules, warts or spines, which, at maturity, frequently fall away to a greater or less extent. Dehiscence by an apical pore or by irregular breaking away of the apical portion. Gleba consisting of simple or branched, long or short, smooth, or in one case (*Mycenastrum*) spiny threads. Sterile base and diaphragm present or absent. Spores globose, typically roughened but occasionally smooth.

In South Africa seven genera are recognised as belonging to the Lycoperdeæ—*Lycoperdon*, *Disciseda*, *Bovista*, *Calvatia*, *Lanopila*, *Mycenastrum* and *Broomeia*. Of these *Lycoperdon* is the best known, containing the largest number of species distributed over the world, of any member of the Gasteromycetes.

1. LYCOPERDON Tournefort ex Persoon.

Synopsis Methodica Fungorum (1801) 138.

Type Species : *Lycoperdon perlatum* Pers.

Plants globose, subglobose or pyriform, attached to the substratum by means of basal, root-like threads. Peridium of two layers—a usually fugacious, roughened exoperidium and a thin, membranaceous, persistent endoperidium—the latter dehiscing by means of an apical aperture. A sterile base, with or without a diaphragm, may or may not be present. Gleba finally pulverulent, consisting of capillitium and spores. Capillitium threads long, simple or branched, septate or not, coloured or hyaline, usually varying in thickness. Spores coloured, globose or oval, smooth, verrucose or echinulate, pedicellate or not.

To this genus belong the true "puff balls" or "monkey snuff-boxes" as they are sometimes locally termed, so-called on account of their ball-like shape and the fact that the spores are ejected from an aperture in the apex of the mature plant in clouds or puffs. Most *Lycoperdons* are white or yellowish when young, but change to some shade of grey or brown with maturity. The plants are comparatively small in size and grow on the ground in open or shaded places, or occasionally on decayed wood. All species are said to be harmless, provided they are eaten young, when the flesh is still white and solid.

It is difficult to say how many clearly defined species of *Lycoperdon* occur in South Africa. About 39 different species have been described from time to time, but many of these are synonymous with species occurring elsewhere, while a few have been transferred to the genus *Calvatia*. For these reasons about 19 names have been excluded from the present paper. There are also about eight of the old species of which no material is available for examination and of which the published descriptions are too inadequate for recognition of the plants. These have been included in a section by themselves at the end of the classified species. Only 17 species are recognised as specifically distinct and of these two are considered to be so far underscribed.

Key to the Species.

Spores not pedicellate.

Capillitium hyaline.

Sterile base well developed, cellular.

Diaphragm present.

Gleba yellow, brown or olive.....

1. *L. hyemale*.

Gleba some shade of purple.....

2. *L. djurense*.

Sterile base small, compact.....

3. *L. subincarnatum*.

Capillitium coloured.

Capillitium not or sparingly branched.

Sterile base of large cells, 2 mm. or more diameter.

Diaphragm present.....

4. *L. rhodesianum*.

Diaphragm absent.

Exoperidium of conspicuous, pointed verrucae.....

5. *L. perlatum*.

Exoperidium of minute, connivent spines.....

(*L. pyriforme*).

Sterile base of small cells, 1 mm. or less diameter.

Diaphragm absent.

Exoperidium of connivent spines and warts.....

6. *L. Duthiei*.

Exoperidium furfuraceous.....

7. *L. cafferum*.

Sterile base absent.

Exoperidium white, verrucose or furfuraceous.....

8. *L. caespitosum*.

Exoperidium ochraceous yellow, smooth.....

9. *L. flavum*.

Capillitium freely branched.

Sterile base cellular.....

(*L. spadiceum*).

Sterile base compact.....

10. *L. polymorphum*.

Sterile base absent.....

11. *L. pusillum*.

Spores long pedicellate; pedicels persistent.

Sterile base well developed, cellular.

Diaphragm present.

Exoperidium of dark, furfuraceous verrucae.....

12. *L. Qudenii*.

Diaphragm absent.

Exoperidium of dark verrucae.....

13. *L. umbrinum*.

Sterile base scanty, minutely cellular, no diaphragm.

Exoperidium of pallid cruciate spines.....

14. *L. asperum*.

Sterile base absent.

Exoperidium verrucose, gleba yellowish.....

15. *L. Gunnii*.

1. *Lycoperdon hyemale* (Bulliard ex Persoon) Vittadini.[Plate XXXIII, fig. 1, 2, 3 ;
Plate XXXIV.]Bulliard, *Histoires Champignons de la France* 1 (1809) 148 ; emended Vittadini, *Monographia Lycoperdineorum* (1842) 46.Hollós, *Gastero.* (1904) ; Massee, *Journ. Roy. Micro. Soc.* (1887) 712 ; Sacc. *Syll. Fung.* 7 (1888) 115, 480 ; G. H. Cunningham, *Gastero.* (1944) 146.*Lycoperdon depressum* Bonorden, *Bot. Zeit.* (1857) 611 ; Massee, *Trans. Roy. Micro. Soc.* (1887) 714 ; *Trans. Brit. Myc. Soc.* 2 (1906) 98.*L. natalense* Cooke et Massee, *Journ. Roy. Micro. Soc.* (1887) 709 ; Sacc. *Syll. Fung.* 7 (1888) 478.*L. Kalchbrenneri* de Toni, Sacc. *Syll. Fung.* 7 (1888) 109.*L. pratense* Pers., *Trans. Brit. Myc. Soc.* 2 (1906) 160.*L. Curtisii* Berk., *Grev.* 2 (1873) 50.*L. multiseptum* Lloyd, *Myc. Writ.* 4, L. 53 (1914) 9.*L. Eylesii* Verwoerd, *S. Afr. Journ. Sci.* 23 (1926) 292, 294.

Peridium 0.5–5 cm. diam., subglobose, obovate, or sometimes pyriform, narrowing suddenly or gradually towards a furrowed, plicate or lacunose rooting base, sometimes slightly umbonate at the top ; pure white or white with a tinge of yellow at the base, finally discoloured. *Exoperidium* white then ochraceous, covered with small, white pyramidal warts or connivent spines often mixed with granules, usually fugacious in part or the whole of the upper part, but persistent in the basal area ; sometimes furfuraceous at the base, spinulose in the centre and warty at the apex, the whole finally almost smooth. *Endoperidium* deep cream, buff, ochraceous, finally cinereous or parchment coloured, more or less smooth, often with areoles left by the bases of the fallen warts, or obscurely granular or furfuraceous ; dehiscing by a torn, small or large, round or elliptical, apical pore, the surrounding portion of which often finally breaks away, leaving a large, irregular aperture. *Gleba* pulverulent, varying in colour between yellowish, yellowish-olivaceous, liliaceous grey, light grey, slate grey, brown, olivaceous and reddish brown. *Sterile base* present, occupying from one-quarter to one-half of the total height, cellular, cells usually large ; white, becoming ochraceous. *Diaphragm* well defined, straight, convex or concave. *Capillitium* threads scanty in old specimens, usually long, hyaline or tinted olivaceous, usually many septate, sparingly branched, usually thicker than diameter of spores (up to 10.2 μ or more), smooth to granular. *Spores* globose, pale olivaceous-brown, 3.5–4.2 μ diam., almost smooth to coarsely verrucose, sometimes found in semi-permanent, oblong, smut-like balls ; sometimes apiculate or shortly pedicellate ; pedicels usually fugacious.

Habitat : on the ground amongst grass, solitary, caespitose or in groups. A very common species.

Distribution : South Africa ; Australia ; Britain ; Europe ; New Zealand ; Tasmania.

Specimens examined : Pretoria, Dec. 1909, *E. M. Doidge*, 958 ; Jan. 1919, *A. M. Bottomley*, 11864, 11866 ; Feb. 1939, *A. M. Bottomley*, 33462, 33772 (spores pedicellate) ; Dec. 1938, *A. M. Bottomley*, 35530 ; Jan. 1919, *C. P. Lounsbury*, 11867 ; April 1924, *E. M. Doidge*, 21583 ; Groenkloof, Pretoria, *I. B. Pole Evans*, 8780 ; Aug. 1916, *J. Sellschop*, 9775 ; March 1924, *K. A. Lansdell*, 18144 ; Kilmerton, Pretoria, March 1912, *P. J. Pienaar*, 2242 ; Garstfontein, Pretoria, Feb. 1911, 18089 ; March 1911, *P. J. Pienaar*, 1876 ; Fairy Glen, Pretoria, Feb. 1928, *A. M. Bottomley*, 23169 ; Brenton, Knysna, *A. V. Duthie*, 31347 ; Belvidere, Knysna, *A. V. Duthie*, 31348 as *L. pratense* ; Johannesburg, *E. M. Doidge*, 27804 ; Rondebosch, Feb. 1937, *E. L. Stephens* 450, 34534 ; Brandfort, O.F.S., *L. Verwoerd*, 34535 ; O.F.S., Jan. 1937, *Miss Olivier*, 34557 ; Pietermaritzburg, *Rump* 389, 30798 ; Van Reenen, Natal, Dec. 1912, *M. Franks*, 5666 ; Mbabane, Swaziland, March 1911,

T. A. Stewart, 1557; Kirstenbosch, C.P., *S. Garabedian*, as *L. gemmatum* (S.A.M. 45896); Knysna *A. V. Duthie* as *L. pratense* (v. d. Byl 2034); Cape, *R. S. Adamson* (E. L. Stephens 447) 35533; Salisbury, S. Rhodesia, *F. Eyles* 4089 (v. d. Byl 2223) as *L. Eylesii* (specimens differ from typical *L. hyemale* only in very small size); Beatrice, S. Rhodesia, April 1926, *Eyles* 4090 (S.R. 3823); Boschberg Mts., Somerset East, *MacOwan* 1003 as *L. gemmatum* (sub *L. caffrorum* Kalchbr. & Cooke in *Fungi MacOwaniani*) (S.A.M. 35051) 22060.

Specimens not seen: Knysna, *Duthie* 38, 256 (Lloyd, Myc. Coll. 53127, type of *L. multiseptum*, 51764; Inanda, Natal, *Medley Wood* 358, 361, as *L. natalense* Cooke & Mass. in Herb. Kew; Natal, *Medley Wood* 185 as *L. Curtisii* Berk.; Somerset East, *MacOwan*, as *L. Curtisii*; slope of Katberg, Jan. 1939, *E. L. Stephens* 428.

The distinguishing features of this species are the apical connivent spines of the exoperidium, the hyaline to tinted, septate capillitium threads, the usually well developed, cellular sterile base and the presence of a well defined diaphragm. It is a very variable plant as regards size, colour of the gleba and size and shape of the sterile base. The colour of the gleba may vary even in plants of one collection, therefore, with one exception (cf. *L. djurense*) it has not been possible to separate species on the colour of the gleba. The size of the sterile base varies according to the shape of the plant—small in subglobose plants and large in subpyriform.

This is the commonest species in South Africa, usually occurring in grassy places. It is a frequent cause of "Fairy Rings" in bowling and golf greens.

Hollós (l.c.) has been followed in including *L. depressum*, *L. Kalchbrenneri*, *L. marginatum* and *L. Curtisii* as synonyms of *L. hyemale*, Cunningham (l.c.) in including *L. natalense* and Lloyd in including *L. pratense*. Descriptions of these species do not indicate any important point of difference from the South African plant.

2. *Lycoperdon djurense* P. Hennings. [Plate XXXV, fig. 2.]

Hedwigia (1901) 100.

Lloyd, Myc. Writ. 5, L. 66 (1917) 16; Verwoerd, Ann. Univ. Stell. 3 (1925) 32.

? *L. endotephrium* Pat., Bull. Soc. Myc. Fr. (1902) 300; Sacc. Syll. Fung. 17 (1905) 231.

Peridium 1.5–4.5 cm. wide, 1–2.3 cm. high, subglobose, pulvinate or obconic, usually sulcate or lacunose towards the base, attached by mycelial threads. Young plant pure white or yellowish towards the base, becoming discoloured a pale brownish or greyish colour. *Exoperidium*, upper part covered with white, pyramidal warts, which consist of groups of broad spines the tips of which connive. These become progressively smaller towards the base finally consisting of mealy particles; usually fugacious in the upper part, especially in wet weather, and more or less persistent in the basal half. On a hot day following rain, the exoperidium may split irregularly from the apex downwards and break away in patches, exposing the endoperidium. *Endoperidium* white, becoming parchment coloured or pale grey when old, or occasionally purplish slate grey due to the presence of liberated spores, smooth, obscurely furfuraceous or finely reticulated in the upper part, opening by an irregular round or elliptical pore, which may enlarge considerably with age. *Gleba* white, then Light Mouse Gray to Mauve Grey, later Deep Mouse Gray or occasionally Deep Grayish Olive or ochraceous grey, finally Purplish Gray or Dark Olive Gray. *Sterile base* present, cellular, white, finally ochraceous or pale brown, straight, concave or sometimes convex in the centre, occupying from one-quarter to one-half of the total height. The size of the sterile base varies according to the shape of the plant, being smaller in subglobose plants than in plants narrowed towards the base. *Diaphragm* present. *Capillitium* threads hyaline or tinted, even or sometimes nodulose and irregular, often granular, sparingly

branched, septate; of varying thickness up to twice the diameter of the spores, typically thicker than diameter of spores. *Spores* globose, violaceous, grey or olivaceous grey, verrucose (examined dry) average size 3-4 μ , often shortly pedicellate or apiculate.

Habitat: on ground, often amongst short grass, solitary or gregarious, or caespitose in small or large, closely packed clusters (up to 20 individuals).

Distribution: South Africa; Central Africa.

Specimens examined: Pretoria, 1919, A. M. Bottomley, 11865, March 1945, 34589; Rietfontein, Pretoria, Venter, 14487; Wonderboom, Pretoria, March 1917, H. A. V. King; 10050; Rietvlei, Pretoria Distr., March 1945, J. P. H. Acocks, 34574, Bottomley, 34577, Meintjeskop, Pretoria, March 1921, A. M. Bottomley, 14648; Garstfontein, Pretoria Distr., Jan. 1946, A. M. Bottomley, 35426; Johannesburg, March 1934, Mr. Barraclough, 27385. Schroeders, Natal, 1917, P. A. v. d. Byl (N.H. 462) 31761; Stellenbosch, Eyles 6667 (S. Rh. 3906); Salisbury, S. Rhodesia, Feb. 1920, F. Eyles 2524, 14855. (Duthie 302, 31470; identified as *L. djurense* is not this species; it is possibly an immature *L. Gunnii*.)

I have followed Lloyd (l.c.) and Verwoerd (l.c.) in retaining *L. djurense* as a separate species, but it so much resembles *L. hyemale* in every particular except the colour of the gleba that it would probably be better treated as a colour form of the latter. The colour of the gleba is a very variable factor and specimens with a violaceous gleba may be found in a collection in which the gleba is typically olivaceous or olivaceous-brown. I have therefore limited the species to plants in which the gleba is some shade of purple in every stage of growth. Specimens in collections Nos. 34574 and 34577 are typically characteristic, not one specimen amongst hundreds showing any but a violaceous gleba from the youngest to the oldest plants.

It is not clear when a violaceous gleba first came to be associated with *L. djurense*, since in Henning's original description the colour of the gleba is given as pale brown ("gleba pallide umbrina"). Lloyd (l.c.) on what authority it is not known, makes the following remarks with regard to this species:—"This is the only *Lycoperdon* known to me with purple gleba and hyaline capillitium and it has only been collected in Africa. Hennings named it *L. djurense* in 1901 and Patouillard *L. endotephrum* in 1902. I think Masee had it as *L. natalense*".

Patouillard describes the gleba of *L. endotephrum* as dirty violet, but Masee does not mention the gleba of *L. natalense* at all and merely describes the spores as "olive with a tinge of Purple". *L. endotephrum* is therefore left tentatively as a synonym of *L. djurense*, but *L. natalense* is cited as a synonym of *L. hyemale*.

3. *Lycoperdon subincarnatum* Peck.

Annual Report of the New York State Museum of Natural History, Botany, 24th Rep. (1872) No. 82.

Sacc. Syll. Fung. 7 (1888) 131, 484; G. H. Cunningham, Gastero. (1944) 147.

Lycoperdon tephrum Berk. in Herb. ex Masee, Journ. Roy. Mic. Soc. (1887) 723.

Peridium 1.2-2.5 cm., usually globose, rarely depressed or obovate. *Exoperidium* of small pyramidal warts, fugacious except towards base, whitish or ochraceous-cinereous. *Endoperidium* reddish brown, greyish-ochraceous or parchment coloured, becoming smooth or faintly reticulate in upper portion, flaccid, opening by an apical pore. *Gleba* umber brown. *Sterile base* absent. *Capillitium* threads hyaline or tinted yellowish-green, fairly frequently septate, sparingly if at all branched, diameter the same or larger than that of spores. *Spores* yellowish green, finally olivaceous, finely verruculose, globose, 3-4.6 μ diam., many with short, deciduous pedicels.

Habitat : on fallen trees or amongst moss on dead wood ; caespitose to gregarious.

Distribution : South Africa ; North America ; Australia.

Specimens examined : Cathkin Peak, Loskop, Natal, Feb. 1943, *H. Lawrence*, 35337.

This species is stated by Cunningham to be characterised by the peculiar pitted nature of the upper part of the peridium, the hyaline, septate capillitium, the very scanty, compact sterile base (when present) and the unusual habitat, i.e. decaying wood.

4. *Lycoperdon rhodesianum* Verwoerd.

South African Journal of Science 25 (1928) 237.

Peridium 2 cm. high, 3 cm. wide, subglobose or basin-shaped, sessile. *Exoperidium* furfuraceous. *Endoperidium* brown, thin, smooth, dehiscing by an apparently small, irregular mouth. *Gleba* olivaceous, with a sterile base of large cells, separated from the fertile portion by a diaphragm. *Capillitium* threads brown, unbranched, uniform, non-septate, 3-6 μ diam. *Spores* globose, hyaline to tinted, smooth, 3.6 μ diam. (Description ex Verwoerd, l.c.).

Habitat : on ground.

Distribution : South Africa.

South African Record : Salisbury, S. Rhodesia, *F. Eyles* 4223 (v. d. Byl 2412).

Verwoerd (l.c.) considers that this species is nearly related to *L. hyemale*, from which it differs in the following characters :—endoperidium brown instead of light yellow ; mouth small instead of large and torn ; exoperidium furfuraceous instead of shortly spiny ; capillitium threads brown, unbranched, non-septate, 3-6 μ thick, instead of hyaline to tinted, branched, septate, 6-8 μ diameter, spores 3-6 μ instead of 4 μ diameter.

5. *Lycoperdon perlatum* Persoon. [Plate XXXV, fig. 1.]

Synopsis Methodica Fungorum (1801) 148.

G. H. Cunningham, *Gastero*. (1944) 149.

Lycoperdon gemmatum Batsch, *Elench. Fung.* (1783) 147.

L. excipuliforme (Scop.) Vitt., *Mon. Lyc.* (1842) 193.

L. montanum Quel., *Champ. Jura* (1876) 444.

L. colensoi Cooke et Massee, *Journ. Roy. Micr. Soc.* (1887) 711.

L. tasmanicum Mass., *Kew Bull.* (1901) 158.

L. excoriatum Lloyd, *Myc. Writ.* 2, Notes 22 (1905) 229.

L. macrogemmatum Lloyd, *Myc. Writ.* 2, Notes 22 (1906) 265.

Peridium up to 4.5 cm. high, 3 cm. wide, subglobose, obovate, but usually turbinate or pyriform ; in the latter case the globose, subglobose or hemispheric apical portion becomes attenuated gradually or suddenly into a cylindrical, stout, smooth, stem-like base, which is attached to the substratum by mycelial threads. *Exoperidium* thickly studded with minute, more or less persistent, straw-coloured, furfuraceous verrucae and granules on the basal part ; in the apical portion, the verrucae are rather more distant, slightly sunken, and interspersed with larger, darker, more pointed, more erect verrucae, the latter soon falling off and leaving minute (about 0.50 mm.) light-coloured, round, shallow depressions between the furfuraceous granules, which produce an areolated, sometimes reticulated effect. Small verrucae and granules ochraceous to olivaceous-brown, larger ones umber. *Endoperidium* straw-coloured, buff, greyish-brown, pale brown, olivaceous-brown (nearest

Isabella, Buffy Brown), smooth, often shining, minutely pitted or areolate where the verricae have fallen off; opening by an apical, raised, torn mouth. *Sterile base* present, usually large, occupying the stem-like base, distinctly cellular, up to 1 mm. diam., dirty white, straw-coloured to pale brown, often centrally convex. No diaphragm present, but sterile base well demarcated from the gleba. *Gleba* old gold when mature, later greyish brown, olivaceous, chestnut brown, olivaceous-ochraceous (Buffy Brown, Saccardo's Umber) pulverulent. *Capillitium* threads long, copious, densely aggregated together at the central protruding point of the sterile base when present, tinted to brownish, olivaceous, chestnut brown, even or irregular in parts, non-septate, sparingly branched, varying in thickness up to much thicker than spores, smooth or with fragments of tissue slightly obscuring the walls. *Spores* globose, finely and closely verrucose, tinted to olivaceous, 3.5–5 μ diam., sometimes pedicellate in dry condition, pedicels deciduous, hyaline, up to 10.2 μ long.

Habitat : on ground or decayed vegetable matter, single, in groups or caespitose.

Distribution : North, East and South Africa; North and South America; Australia; Britain; Europe; India; Tasmania; New Zealand.

Specimens examined : Wilderness, C.P., May 1923, *E. M. Doidge*, 17794; Deepwalls, Knysna, *J. Phillips* (v. d. Byl 2221) 18147 as *L. gemmatum*; Kirstenbosch, April 1940, *A. J. Middlemost* (*E. L. Stephens* 517).

Specimens not seen : Uitenhage, *Zeyher*.

The peculiar verrucae of the exoperidium, which fall away, leaving the endoperidium areolate or reticulate, and the large, sterile, cellular base distinguish this species.

Cunningham finds the spores to be without pedicels, but in the South African specimens examined, many were found to be pedicellate, the pedicels falling off for the most part when mounted in water or lacto-phenol.

6. *Lycoperdon Duthiei* n. sp., [Plate XXXIX, fig. 3.]

Peridio 2.7 cm. alto, 2.2 cm. lato, obovate vel piriformi basi in conformationem caulis attenuato. *Exoperidio* ochraceo-umbrino, cum spinulis et raris verrucis tecto. *Endoperidio* ochraceo-griseo, nitido, parte superiore deinde areolata, ostiolo irregulare demum magno et lacerato. *Gleba* matura olivaceo-umbrina, basi sterili bene evoluta, cellulosa. *Septo* transverso nullo. *Capillitio* colorato, parce ramoso, usque 7 μ crasso. *Sporis* globosis, subglobosis, nonnullis ovatis et brevibus pedicellatis, levibus raro verrucosis, 4–6 μ diam., interdum 7 \times 4 μ diam., primo pallidis demum olivaceo-umbrinis.

Habitat in solo, Kirstenbosch, leg. Duthie, 35338.

Peridium 2–7 cm. high, 2.2 cm. wide, obovate or pyriform, attached by a thick rooting structure. *Exoperidium* ochraceous brown, covered with scattered warts and groups of connivent spines, which break away from the upper portion. *Endoperidium* ochraceous-grey, shining, areolate where exoperidial warts have fallen off; opening by an irregular apical mouth, which later becomes a large, torn aperture. *Gleba* olivaceous-brown to umber. *Sterile base* concave, well-developed, cellular, cells small, occupying the stem-like base. *Diaphragm* lacking. *Capillitium* threads olivaceous-brown, occasionally branched, varying in thickness up to the maximum spore diameter, but usually the size of the average spore. *Spores* globose or sub-globose, many spores slightly ovate and apiculate or shortly pedicellate (dry spores often pedicellate); sparsely verrucose, epispore dark and well defined; vacuole conspicuous; 4–6 μ diam., occasionally 7 \times 4 μ , pale to dark olivaceous brown.

Habitat : on ground.

Distribution : South Africa.

Specimen examined : Kirstenbosch, *Duthie 44 pr. parte*, 35337, Kew.

Unfortunately only one specimen of this species was available for examination, forming part of Dr. Duthie's collection No. 44, the remainder of which is *L. umbrinum*. It seems sufficiently distinct, however, from named species to warrant specific distinction. Its distinguishing features are the ochraceous brown exoperidium of groups of connivent spines and scattered warts, the well-developed, concave, sterile base of small cells and the ovate or subglobose, smooth spores. Miss Wakefield kindly compared this specimen with descriptions and material of *Lycoperdon* spp. at Kew but found that it differed in one respect or another from all of them.

7. *Lycoperdon caffrorum* Kalchbrenner et Cooke.

Grevillea 10 (1882) 109.

Massee, Journ. Roy. Micr. Soc. (1887) 707 ; Sacc. Syll. Fung. 7 (1888) 129.

Peridium 5–7 cm. wide, 4–6 cm. high, pyriform, tapering towards the base. *Exoperidium* furfuraceous, fugacious. *Endoperidium* ferruginous, bay brown (Verona Brown) at first almost smooth, then breaking up into minute scales. *Gleba* brownish-olivaceous (Tawny Olive). *Sterile base* present, light brown, compact, indistinctly cellular. *Diaphragm* lacking. *Capillitium* threads hyaline to tinted olivaceous, pitted, sparingly branched, non-septate. *Spores* olivaceous brown, globose, average size 4 μ diam., finely verrucose.

Habitat : on ground.

Distribution : South Africa.

Specimen examined : in grassy places, Boschberg Mts., Somerset East, 1879, MacOwan 1424, 22059, Type.

MacOwan's specimens No. 1003, 22060, labelled *Lycoperdon gemmatum* L., (sub. *L. caffrorum* Kalchbr. & Cooke in Fungi MacOwaniani) are believed to be *L. hyemale* and are referred to this species. They show the typical exoperidium, well developed cellular base, diaphragm and septate, hyaline capillitium threads.

According to Kalchbrenner and Cooke, *L. caffrorum* somewhat resembles *L. Gardneri* Berk., but is smaller, deeper coloured, with spores not so rough.

8. *Lycoperdon caespitosum* Welwitsch et Currey.

Fungi Angolenses in Trans. Linn. Soc. 26 (1870) 289.

Massee, Journ. Roy. Micr. Soc. (1887) 725 ; Sacc. Syll. Fung. 7 (1888) 120.

Peridium 0.5–4 cm. diam., globose, strongly rooting. *Exoperidium* white, verrucose or finely furfuraceous, for the most part fugacious. *Endoperidium* (Cinnamon Brown) drying yellowish white, parchment-like in weathered specimens, finally membranaceous, smooth and polished. *Gleba* ochraceous brown (Tawny Olive). *Sterile base* wanting. *Capillitium* threads hyaline to tinted yellowish or clay-coloured lilaceous, sparingly branched, occasionally septate, punctate, of varying thickness, from smaller to larger than spore diameter. *Spores* almost hyaline to olivaceous-yellow, yellowish lilaceous, 2.5–5 μ diam. (Massee l.c., gives 5–6 μ diam.), thick walled, obscurely verrucose when mature.

Habitat : on ground, caespitose, gregarious.

Distribution : South Africa.

Specimen examined : in open grassy places near Somerset East, MacOwan 1005 a, 22058, Kew.

Specimens not seen : in upland poor meadows, Morre de Lopollo, Huilla, Welwitsch 145.

MacOwan has numbered both *L. caespitosum* and *L. flavum* 1005, the first-named is therefore referred to as 1005 a and the second 1005 b.

9. *Lycoperdon flavum* Massee, [Plate XXXVI, fig. 1, 2.]

Journal of the Royal Microscopical Society (1887) 721.

Peridium up to 2 cm. high, 3·5 cm. wide, pulvinate, abruptly constricted into a rooting base. *Exoperidium* smooth, ochraceous-yellow, finally Chestnut Brown with scattered white flecks. *Endoperidium* thick, smooth, cheesy and yellow when young, becoming Chestnut Brown, flaccid and papery, dehiscing by an apical mouth. *Gleba* yellow, finally dark grey (Dusky Drab). *Sterile base* absent. *Capillitium* threads almost hyaline to pale brownish-olivaceous, sparingly branched, sparsely if septate, wavy, occasionally with small projections, varying considerably in thickness up to diameter of spores. *Spores* globose, pale brownish-olivaceous, finely verrucose when mature, 4·5 μ diam.

Habitat : in grass lawns after continuous rains, solitary or caespitose.

Distribution : South Africa.

Specimens examined : Pretoria, Jan. 1939, A. M. Bottomley, 35528, January 1943, E. Scott, 34580, and numerous previous collections from the same locality.

Specimens not seen : Cape, MacOwan 1005 b, Kew (cf. note on *L. caespitosum*).

The distinguishing features of this species are the smooth, ochraceous-yellow exoperidium, the yellow, cheesy consistency of the mature plant and the usually deliquescent nature of the mature gleba. Collections have only been made during very wet spells in summer, and unless collected when immature, and brought indoors, the whole plant deliquesces at maturity into a wet pulp, changing from a clear ochraceous-yellow, solid, cheesy structure to a soft, wet, brown mass. When kept indoors, the endoperidium turns a chestnut brown and becomes flaccid and papery, while the gleba becomes pulverulent.

The above description differs from the original in larger size, absence of spines on the capillitium threads and the deliquescent character. An examination of the original material at Kew, kindly made by Miss Wakefield, did not reveal any trace of the "spiny" capillitium described by Massee and the other characters may vary under different climatic conditions. Since the plants otherwise appear to agree with Massee's plant, and do not fit in better with any other described species, they are tentatively referred to *L. flavum*, although the latter is only known from MacOwan's original dried material and may be found to be synonymous with some other species.

10. *Lycoperdon polymorphum* Vittadini, [Plate XXXVIII, fig. 1.]

Monographia Lycoperdineorum (1842) 39.

Lycoperdon coloratum Peck, N.Y. Nat. Hist. Mus., 29th Rept. (1878) 29.

L. cepaeforme (Bull.) Mass., Journ. Roy. Micr. Soc. (1887) 722.

L. furfuraceum Schaeff. ex de Toni, Sacc. Syll. Fung. 7 (1888) 110.

L. hungaricum Hollós, Mathem. Term. 69 (1901) 1.

L. nigrum Lloyd, Myc. Writ. 1, Lyc. Aus. (1905) 30.

Peridium 1·2–4 cm. wide, 1·5–3·5 cm. high, depressed-globose or sub-pyriform when contracted into a more or less lacunate, stalk-like base. *Exoperidium* furfuraceous or of minute verrucae, fugacious or more or less persistent in lower part, whitish or ochraceous, becoming ochraceous-brown, olivaceous brown (Old Gold, Buffy Brown), umber or blackish-brown (Tawny Olive, Snuff Brown). *Endoperidium* ochraceous, ochraceous-brown, olive brown (Old Gold, Buffy Brown) becoming olivaceous-brown, umber or blackish brown; papery, smooth, dull or polished, dehiscing by a torn, apical mouth. *Gleba* yellowish becoming olivaceous, olivaceous-brown or umber. *Sterile base* present, scanty or well-

developed, compact, usually consisting of closely interwoven hyphae resembling the capillitium threads, or occasionally very obscurely cellular; cream, becoming greenish-yellow olivaceous, slate grey, brownish-grey, finally brown (Warm Sepia or Snuff Brown). *Diaphragm* absent. *Capillitium* threads pale olivaceous, brownish to deep brown, sparingly or freely branched, straight or wavy, smooth or occasionally slightly nodose, varying in thickness from smaller to larger than diameter of spores. *Spores* globose, subglobose broadly oval, long oval or slightly ovate, oval shape predominating, 3.4–5.5 μ diam., occasionally up to 6.8 μ diam. in the case of oval spores, tinted brown or olivaceous, obscurely to strongly verrucose; apiculate to shortly pedicellate; pedicels sometimes up to 8.5 μ long; concolorous, wedge-shaped structures sometimes mixed with the spores.

Habitat : solitary or gregarious in grassy places or under trees and bushes.

Distribution : South Africa; North America; Australia; Britain; Europe; New Zealand.

Specimens examined : Pretoria, April 1913, *I. B. Pole Evans* 6683, May 1919, *H. V. King* 12339, Jan. 1928, *L. Reinecke* 23138; Garstfontein, Pretoria, February 1939, *A. M. Bottomley*, 30704; *P. J. Pienaar*, April 1911, 1355; Roseville, Pretoria, March 1911 *P. J. Pienaar*, 1939; Rietvlei, Pretoria, March 1945, *A. M. Bottomley*, 34590; Wonderboom, Pretoria, March 1917, *H. A. V. King*, 10051, det. Lloyd; Meintjes Kop, Pretoria, March 1925, *A. M. Bottomley*, 20390; Vereeniging, January 1926, *E. Brandmuller*, 20635; Ingogo, Natal, May 1920, *A. O. D. Mogg*, 13796; Papegaisberg, *A. V. Duthie* 303 (v. d. Byl 2035) 31471; King's Park, Bloemfontein, *G. Potts* 7174, 13001; *Lennard*, 20653; Fountains Valley, Pretoria, March 1936, *A. M. Bottomley* *B. Louwrens*, 28592; without locality (*P. v. d. Byl* 1421), ex *Herb. Lloyd*; Forest Hall, Knysna, Feb. 1918, *A. V. Duthie* 211, 31400 as *L. oblongisporum*; Potchefstroom, Tvl., July 1935, *J. Sellschop*, 28515.

This species is characterised by its compact, sterile base composed of closely interwoven hyphae, resembling the structure of the fertile part. This may be well-developed or scanty, and in the latter case the plant is difficult to distinguish from *L. pusillum* which has no sterile base. The latter species is, however, smaller, smoother and more globose. The specimens listed above are considered to be the South African form of *L. polymorphum* differing from that found elsewhere in the shape of the spores, which are not typically globose, but vary from globose and subglobose to broadly oval, elliptic oval and sub-ovate, with the broadly oval or elliptic oval shapes always predominating. The oval spores suggest *L. oblongisporum* Kalchbr. & Cooke, and in fact Lloyd identified *Duthie* 211 as that species, with the remark that this species corresponds to *L. cepaeforme* (a small form of *L. polymorphum*) in every respect except the shape of the spores. According to Lloyd [*Myc. Writ.* 2, *Myc. Notes* 20 (1905) 235] the sterile base of *L. oblongisporum* is scanty and composed of minute cells; the presence of the characteristic sterile base appears to be sufficient justification for referring the South African plant to *L. polymorphum*. Verwoerd (*Ann. univ. Stell.* 3, 1925 : 32) follows Lloyd in considering *Duthie* 211 as *L. oblongisporum*; he does not deal with any *polymorphum* form.

11. *Lycoperdon pusillum* Batsch ex Persoon, [Plate XXXVIII, fig. 2, 3.]

Journal de la Botanique 2 (1809) 17.

Hollós, *Gastero. Ung.* (1904) 107; Rea, *Brit. Basid.* (1922) 37; Coker & Couch *Gastero.* (1928) 91; Bresad. *Icon. Myc.* 23 (1932) 1139; Verwoerd, *Ann. Univ. Stell.* 3 (1925) 3; G. H. Cunningham, *Gastero.* (1944) 152.

Bovista pusilla Pers., *Syn. Meth. Fung.* (1801) 138.

Lycoperdon dermatoxanthum Vitt., *Monogr. Lyc.* (1842) 34.

L. reticulatum Berk., Fl. N.Z., 2 (1855) 190.

L. mundula Kalchbr. ex Kalchbrenner & Cooke, Grev. 9 (1880) 3.

L. pseudopusillum Hollós, Noev. Koezl., 2 (1903) 75.

Globaria samoense Bres. ex Lloyd, Myc. Writ. 1, Myc. Notes 5 (1901) 50.

Lycoperdon semi-immersum Lloyd, Myc. Writ. 7, Myc. Notes 73 (1924) 1306.

Peridium 1–2 cm. diam., globose or subglobose, strongly rooting by a single or branched mycelial thread. *Exoperidium* white, then yellowish, consisting of fugacious or partly persistent, floccose or mealy squamules, which may split up into flattened verrucae and furfuraceous fragments, which give the mature plant a slightly areolated appearance. *Endoperidium* white or yellow, becoming pale brown and finally umber (Buffy Brown), very thin and papery, smooth, shining, dehiscing by a small, irregular apical pore. *Gleba* white, then yellow, finally greyish-brown, light olivaceous-brown or olivaceous (Olive Lake finally Buffy Brown). *Sterile base* absent. *Capillitium* threads subhyaline to ochraceous or olivaceous-brown, smooth or pitted, straight or wavy, even or with rounded or pointed projections, sparingly or freely branched, up to 6 μ diam. *Spores* globose, sometimes subglobose, obconic or broadly oval, smooth or obscurely verrucose, subhyaline or tinted olivaceous, 3.4–6 μ diam., often apiculate, sometimes pedicellate; pedicels, when present, hyaline; spores sometimes in long, sub-persistent bundles.

Habitat: on wet ground, solitary or gregarious.

Distribution: East and South Africa; North America; Asia; Australia; Britain; Ceylon; China; Europe.

Specimens examined: Pretoria, January 1943, *A. M. Bottomley* *E. Scott*, 33773; *L. Reinecke*, 23150; Jan. 1939, *A. M. Bottomley*, 35529; Gezina, Pretoria, February 1912, *Rev. N. Roberts*, 2044; Papegaaisberg, Stellenbosch, *Duthie* 318, 31483; Brandfort, *Schonken* (Duthie 296) 31465; King's Park, Bloemfontein, March 1917, *G. Potts* 7175, 13002; Bloemfontein, *G. Potts* 7183, 13007; Alicedale, May 1919, 12185 (spores oval, obconic); Potchefstroom, July 1935, *J. Sellschop*, 35527; Salisbury, S. Rhodesia, *Hopkins*, (P. v. d. Byl 2539); Nov. 1932, *Eyles* 7220 (S. Rh. 3915); Avondale, S. Rhodesia, Dec. 1928 (S. Rh. 153); without locality (v. d. Byl 2082); Garstfontein, Pretoria, Jan. 1946, *A. M. Bottomley*, 35427.

Specimens not seen: Somerset East, *Tuck* (MacOwan 115 b).

This species is characterised by its small, subglobose, rooting peridium, the absence of a sterile base and its usually freely branched capillitium. It varies considerably, however, in the size of the peridium, the size and degree of roughness of the spores and the branching of the capillitium.

In very wet weather, the gleba partially deliquesces from the base upwards (fig. 2) making the whole plant soft, wet and olivaceous-brown and sometimes results in complete collapse. Under dry conditions the plant behaves normally.

12. *Lycoperdon Qudenii* n. sp., [Plate XXXIX, fig. 2.]

Peridio 3.2 cm. alto 2 cm. lato, piriformi, deorsum in stipitem attenuato. *Exoperidio* verrucis furfuraceis umbrino-nigris dense ornato, verrucis a superiore parte demum secentibus. *Endoperidio* argenteo-griseo vel griseo-umbrino, levi, apice areolato. *Gleba* umbrina, pulverulenta. Parte sterili cellulosa, ochracea, concava et a parte fertile per septum distincte separabili. *Capillitio* olivaceo-umbrino, parce vel saepe ramoso, septis nullis, crassitudine variabile, plerumque spora adaequante. *Sporis* globosis subtiliter verrucosis, 4–5 μ diam., demum olivaceo-umbrinis, plerumque pedicellatis; pediculis hyalinis, tenuis ad 13.6 μ longis.

Hab. in sylvis, Qudeni, leg. *P. H. B. Talbot*, 34144.

Peridium up to 3.2 cm. high, 2 cm. wide, pyriform, narrowing sharply into a stem-like base; attached by mycelial threads. *Exoperidium* of closely and evenly distributed, brownish-black, furfuraceous verrucae or squamules, which are less dense on the stalk-like base and fugacious in the apical area. *Endoperidium* silver grey to pale greyish brown, smooth, becoming finely areolated in the upper portion, due to the disappearance of the fugacious verrucae. *Gleba* umber, pulverulent. *Sterile base* well developed, occupying the stem-like base, large cellular, ochraceous, concave. *Diaphragm* present, well defined. *Capillitium* threads olivaceous-brown, usually darker than the spores, sparingly to fairly frequently branched, non-septate, varying in thickness up to larger than the diameter of the spores, but usually of the same size. *Spores* globose, finely verrucose, 4-5 μ diam., pale to dark olivaceous brown, with darker, well defined epispore, usually pedicellate; pedicels hyaline, slender, up to 13.6 μ long.

Habitat : on humus in forest.

Distribution : South Africa.

Specimens examined : Qudeni Forest Reserve, Zululand, 18-2-45, P. H. B. Talbot, 34144, Kew.

The distinguishing features of this species are its pyriform shape, the brownish-black furfuraceous verrucae, the large, cellular sterile base and the pedicellate spores. In the only two specimens of the above collection, the cellular base had almost completely disintegrated and disappeared, exposing the concave diaphragm.

Miss Wakefield kindly compared part of the above collection with material of *Lycoperdon* spp. at Kew, but was unable to match it.

13. *Lycoperdon umbrinum* Persoon.

Synopsis Methodica Fungorum (1801) 147.

Lloyd, Myc. Writ. 2, Notes 19 (1905) 209; Myc. Writ. 3, Notes 33 (1909) 438;
Hollós, Gastero. Ungar. (1904) 96, 166; Verwoerd, Ann. Univ. Stell. 3 (1925) 31.

Lycoperdon hirtum Martius, Flor. Erlang. (1817) 386.

L. gemmatum hirtum Fries, Syst. Myc. 3 (1829) 38.

L. sylvaticum Wettstein, Vorarb. Pilzfl. Steierm. (1885) 575.

L. atropurpureum Vitt., Monogr. Lycop. (1842) 42.

L. laxum Bonordon, Botan. Zeitg. (1857) 614.

L. pyriforme Bull., Champ. 1, p. 148.

L. glabellum Peck, U.S. Lycop. in Trans. Albany Inst. 9 (1879) 314; Hollós, Gastero. Ungar. (1904) 101.

Peridium 2.7-3.5 cm. high, 2-3.2 cm. wide, varying considerably in size and shape from subglobose, obovate, egg-shaped to pyriform, with wrinkled stem-like base; attached by mycelial threads. *Exoperidium* of minute, evenly distributed, brownish-black verrucae, which are often fugacious in the apical region. *Endoperidium* ochraceous-brown, smooth, becoming areolate where the verrucae of the exoperidium fall off; opening by an irregular, apical mouth. *Gleba* umber with purplish tint, columella present. *Sterile base* well-developed, cellular, convex, ochraceous-brown. *Capillitium* threads varying in thickness from thin to 6.8 μ diam., almost hyaline to dark brown, copious. *Spores* globose, closely and finely verrucose, 4-5.2 μ diam., tinted to pale olivaceous brown, epispore not well defined; often fairly long-pedicellate in the dry condition, when pedicels hyaline, up to 10.2 μ long; when mounted in lacto-phenol, only occasionally pedicellate.

Habitat : on ground.

Distribution : South Africa; North America; Europe.

Specimens examined : Kirstenbosch, C.P., *A. V. Duthie* 44 (v. d. Byl 2036 ; Stell. 182) 31315.

Specimens not seen : Brandfort, *A. V. Duthie* 296 ; Stellenbosch, *A. V. Duthie* 218.

This species is very variable in colour, size and shape, but can be distinguished by its rough exoperidium, cellular base and coloured capillitium.

14. ***Lycoperdon asperum*** (Léveillé) de Toni, [Plate XXXVII.]

Saccardo, *Sylloge Fungorum* 7 (1888) 119.

G. H. Cunningham, *Gastero.* (1944) 154.

Bovista aspera Lév., *Ann. Sci. Nat.*, ser. 3, 5 (1846) 162.

Lycoperdon australe Berk., *Fl. Tas.* 2 (1860) 266.

Bovistella aspera (Lév.) Lloyd, *Myc. Writ.* 1, *Lycop. Aus.* (1903) 29 ; Verwoerd, *Ann. Univ. Stell.* 3 (1925) 29.

Peridium up to 1.5 cm. diam., subglobose or depressed-globose, yellowish-brown to bay-brown, strongly rooting. *Exoperidium* consisting of closely set, short, blunt, stout, ochraceous spines, conniving in fours, finally falling away, sometimes leaving the endoperidium furfuraceous. *Endoperidium* membranaceous, straw-coloured, yellowish to bay-brown, smooth, dehiscing by a torn apical pore. *Gleba* light olivaceous. *Sterile base* scantily developed, minutely cellular ; no diaphragm. *Capillitium* threads subhyaline to light olivaceous, sparingly, if at all, branched, non-septate, up to slightly thicker than the spore diameter, often pitted. *Spores* hyaline with darker epispore, globose, 3.4–5 μ diam., smooth to minutely verrucose, often pedicellate, pedicels almost hyaline, acuminate, 8–20.4 μ long.

Habitat : Solitary or in small groups on ground.

Distribution : South Africa ; Australia ; Chile ; New Guinea ; Tasmania.

Specimens examined : Johannesburg, *A. M. Bottomley*. 8772 ; Belvidere, Knysna *Duthie* 310, 31477 as *Bovistella aspera* Lév., *Duthie* 312 as *B. aspera*, det. Lloyd.

Specimens not seen : Belvidere, Knysna, *Duthie* 67 (Stell. 170) ; Transvaal, *P. v. d. Byl*.

This species is recognised by its exoperidium of ochraceous, connivent spines, and the usually minute sterile base.

16. ***Lycoperdon Gunnii*** Berk., [Plate XXXIX, fig. 1.]

Flora Tasmaniae 2 (1860) 265.

C. G. Cunningham, *Gastero.* (1944) 154.

Bovistella Gunnii (Berk.) Lloyd *Myc. Writ.* 2, *Lyc. Aus.* (1905) 29.

Peridium up to 2.1 cm. diam., subglobose, ochraceous-brown, sulphur yellow, bay brown, rooting. *Exoperidium* ochraceous or whitish, furfuraceous, tomentose or with minute verrucae or warts, for the most part fugacious, sometimes leaving fragments of brown tomentum or white specks behind. *Endoperidium* becoming bay brown, flaccid, smooth and shining. *Gleba* greenish-yellow, olivaceous-brown (between Light Brownish Olive and Buffy Brown). *Sterile base* absent. *Capillitium* threads greenish-yellow or tinted olivaceous-brown, non-septate, sparingly or freely branched, diameter less than, to exceeding that of the spores. *Spores* tinted or olivaceous-brown, smooth or obscurely verrucose, globose, 4.2–5 μ , pedicellate ; pedicels persistent, up to 13.6 μ long, hyaline or tinted.

Habitat : solitary or in groups on ground.

Distribution : South Africa ; Australia ; Tasmania ; New Zealand.

Specimens examined : Wellington, C.P., May 1911, *A. M. Bottomley*, 1547 ; Stellenbosch, C.P., *A. V. Duthie* 302, 31470 ; Bloemfontein, March 1916, *G. Potts* (Grey Univ. Coll. Herb. 7177) 13003 ; Salisbury, S. Rhodesia, *F. Eyles* 2523, 14861.

The small size, lack of sterile base, furfuraceous exoperidium and persistent pedicellate spores distinguish this species.

Doubtful, unknown and insufficiently described species.

Lycoperdon asperrium Welw. et Curr., [Plate XL, fig. 3.]

Trans. Linn. Soc. 26 (1868) 289.

Sacc. Syll. Fung. 7 (1888) 105.

Peridium about 1 inch high, subglobose. *Exoperidium* of sharp spines which disappear at maturity. *Endoperidium* cinnamon brown, papyraceous. *Capillitium* near reddish brown. *Spores* same colour as capillitium, globose, 4 μ diam., minutely echinulate. [Description ex Welwitsch & Currey l.c., and Saccardo (l.c.).]

Habitat : on ground.

Distribution : South Africa ; North America.

South African Specimens : on sand dunes on banks by Lagoa de Giraul, Mossamedes, Angola, 1859, *Welwitsch* 142 ; Maiombo, Mossamedes, 1859, *Welwitsch* 144.

Welwitsch and Currey make the following remarks with regard to the above collections :—" The spines of the spores (of No. 142) are so minute that they are seen with difficulty even under a high power. No. 144 seems to be the same species, but exhibits no spines on the peridium. The peridium, however, is larger, and the spores reach .0002 inch".

Lycoperdon bicolor Welw. et Curr., [Plate XL, fig. 2.]

Fungi Angollenses in Trans. Linn. Soc. 26 (1870) 290.

Sacc. Syll. Fung. 7 (1888) 119, 479.

Peridium 3.5-5 cm. high, 3.5-4 cm. wide, subglobose, attenuated towards the base into a white stipe about 15 mm. thick. *Endoperidium* leaden fuscous, membranaceous. *Capillitium* threads brown. *Spores* brown, globose, 2.5-6 μ diam., smooth. (In Sacc. Syll. Fung. l.c., the spores are given as 2.5-5 μ on page 119 and as 5-6 μ on page 479.) Description ex Welwitsch and Currey l.c. and Saccardo l.c.

Habitat : on the ground.

Distribution : West Africa, North Africa.

South African specimens : in very damp, woody pastures between Lopollo and Empalanea, Huilla, *Welwitsch* 146.

Lycoperdon capense Cooke et Masee, [Plate XL, fig. 1.]

Journ. Roy. Micr. Soc. (1887) 714, Pl. 16, fig. 450.

Sacc. Syll. Fung. 7 (1888) 48; Ed. Fischer, Hedw. 28 (1889) 7; P. Henn., Engl. Bot. Jahrb. 14 (1892) 360.

Peridium about 5 cm. diam., globose, sessile, plicate below with a long, stout, tapering root. *Exoperidium* minutely furfuraceous, fugacious. *Endoperidium* becoming smooth. *Gleba* yellowish brown, dense. *Capillitium* threads of uniform thickness, about equal in diameter to spores, simple, much interlaced and curled, continuous with the compact, basal stratum. *Spores* bright ochre, tinged citron, globose, 4 μ diam., smooth.

Habitat : on the ground.

Distribution : South Africa.

South African specimens : Cape of Good Hope; Ombale, Ondongo, South-West Africa, Schinz.

With regard to the two species *L. capense* Fr. and *L. capense* Cooke et Masee, Miss Wakefield makes the following remarks :—"Fries in *Fungi natalenses*, p. 150 (p. 30 of reprint) has these two names for two fungi received from the Cape (Zeyher 106) and Natal (Wahlberg) respectively. Of *L. capense* he gives a description which I think validates the name. Therefore Cooke and Masee's "*L. capense*" is a later homonym of *L. capense* Fr. and will have to be renamed if it proves to be a good species". No material of *L. capense* Cooke & Mass. is available for study, so there is no alternative but to include this species amongst the doubtful species.

Lycoperdon capense Fries.

Fungi Natalenses (1848) 150.

Peridium has the habit of *L. gemmatum* but the structure rather of *L. pusillum*. *Exoperidium* granular. *Endoperidium* membranous, flaccid, opening by a small, obtuse mouth. *Sterile base* wanting. *Capillitium* threads very lax. *Spores* brown, not becoming olivaceous. (Description ex Fries l.c.)

Habitat : on ground.

Distribution : South Africa.

South African specimens : Uitenhage, Zeyher 106.

This collection is probably at Upsala.

Lycoperdon Curreyi Masee.

Journ. Roy. Micr. Soc. (1887) 706.

Lycoperdon Welwitschii de Toni, Sacc. Syll. Fung. 7 (1888) 127 (non *L. Welwitschii* Mass., 1887); Verwoerd, Ann. Univ. Stell. 3 (1925) 32.

L. radiculatum Welw. et Curr., Trans. Linn. Soc. 26 (1868) 289; Kalchbrenner, Grev. 10 (1882) 108 (non Dur. et Mont.).

L. atro-violaceum Kalchbr. (nom. nud.), in Herb. S. African Mus.

Peridium 3-10 cm. diam., subglobose to obovate, strongly rooting. *Exoperidium* smooth, finely tomentose, more or less fugacious, buff coloured, becoming purplish umber. *Endoperidium* almost smooth, papery, fragile, reddish brown or clay coloured (Sayal Brown, Avellaneous). *Gleba* ochraceous or straw-coloured finally greyish or dull brown with purplish tinge and very pulverulent. *Sterile base* well developed, up to one-third of the total height,

concave, cellular, finally chocolate brown in colour. *Diaphragm* present. *Capillitium* threads subhyaline, varying in thickness up to the size of the spore diameter, sparingly branched, septate, finally fragmenting. *Spores* globose, hyaline to tinted olivaceous, almost smooth to sparsely or strongly echinulate, $5.2-7\ \mu$ diam.

Habitat : on ground.

Distribution : South Africa.

Specimens examined : Boschberg Mts., Somerset East, MacOwan 1004, 22062 as *Lycoperdon radicans*; ? 1875, MacOwan 1004 (S.A.M. 35050) as "*L. atroviolaceum* Kalchbr. type"; Dec. 1874, MacOwan 1004 (S.A.M. 35050) as *L. atroviolaceum* (*L. radicans*); April 1879, MacOwan 1004 (S.A.M. 35050) as "*L. atroviolaceum*"; MacOwan 1009 as "*Bovista lilacina* (*L. radicans*)" 22061; MacOwan 1009 (S.A.M. 35050) as "*L. atroviolaceum* Kalchbr. nom nud".

Specimens not seen : very rare, in grassy places, Loanda, Penedo distr., West Africa, 1854, Welwitsch No. 116.

The specimens deposited in the South African Museum at Cape Town and especially the 1879 collection appear to be typical *Calvatia lilacina*. The specimens at Pretoria of both MacOwan 1004 and 1009 may be immature *C. lilacina* but are smaller, more globose, with very little sterile base and, while the gleba of No. 1009 is tinged with purple, that of No. 1004 is a uniform buff colour without any trace of purple colouration.

In addition to the above specimens of MacOwan 1004, this number is quoted by Kalchbrenner (Grevillea 10, 1882 : 108) for *L. cyathiforme* which is regarded as a synonym of *C. lilacina*, and is attached to a specimen at Kew named *L. MacOwani*. In connection with the latter, Miss Wakefield states that the specimen does not appear to be *C. lilacina* since no violet colour is present.

***Lycoperdon Gardneri* Berkeley.**

Berkeley and Broome, Ceylon Fungi No. 716 in Journ. Linn. Soc. 14 (1873) 79.

Massee, Monogr. Lycop., Journ. Roy. Micr. Soc. (1887) 716; Sacc. Syll. Fung. 7 (1888) 129, 482.

Peridium 11-12 cm. diam., hemispherical, plicate below, contracted into a thick, rugose, rooting stem. *Endoperidium* tawny, minutely floccose or mealy. *Capillitium* persistent, threads pallid, rarely branched, flaccid, flexuous or contorted. *Sterile base* present, compact. *Spores* pale ochraceous, subglobose, slightly produced at the point attached to the persistent pedicel, smooth, longest diameter $4-5\ \mu$ (description ex Massee, l.c.).

Habitat : on ground in shady woods.

Distribution : South Africa; Ceylon; Venezuela.

According to Berkeley and Broome (l.c.) this species was formerly referred to *L. saccatum* but further specimens showed it to be distinct. The large size, compact sterile base and persistent spore pedicels appear to be the distinguishing features of this species. The presence or absence of a diaphragm is not mentioned.

***Lycoperdon glabellum* Peck.**

N.Y. Nat. Hist. Mus., Bot., 31st Rept. (1879) 39.

Kalchbrenner, Grev. 10 (1882) 109; Massee, Journ. Roy. Micr. Soc. (1887) 707; Sacc. Syll. Fung. 7 (1888) 124, 477; Hollós, Gastero. Ung. (1904) 101.

Peridium 2.5-4 cm. wide, subglobose or turbinate, sometimes narrowed below into a short, stem-like base. *Exoperidium* furfuraceous, with minute, sub-uniform, persistent

warts. *Endoperidium* yellow or brownish-yellow, dehiscing by a small mouth. *Gleba* purplish-brown; columella present. *Capillitium* purplish-brown. *Spores* concolorous, rough, globose, 5–6 μ diam. (Description ex Peek, l.c. and Saccardo, l.c.)

Habitat : on the ground.

Distribution : United States; South Africa.

South African specimens : Somerset East, *MacOwan* 1337; Bazuja, Kaffraria, *Baur*.

Saccardo states that this species is near to *L. cupricum*, and that, according to Kalchbrenner, it is a doubtful species, even in Africa. Hollós cites it as a variety of *L. umbrinum*.

***Lycoperdon laetum* Berk.**

Hooker's London Journal of Botany 2 (1843) 419.

Massee, Journ. Roy. Micr. Soc. (1887) 718; Sacc. Syll. Fung. 7 (1888) 483.

Peridium about 4 cm. high, 5 cm. wide, subglobose or lenticular, contracted into a stout, stem-like cellular base about 1.8–2 cm. high, 2.5 cm. thick, or base almost obsolete. *Exoperidium* reddish-brown, subcoriaceous, sulcate, becoming furfuraceous or almost smooth, pale; breaking away in rimosely areolate patches from the upper portion, leaving a cup-like opening. *Gleba* pale reddish-brown. *Sterile base* large, occupying the stem-like portion, cellular, spongy, compact. "*Capillitium* sublenticular, hollowed beneath, yellow; flocci pellucid, branched, not rough". *Spores* yellow, then yellow-olive, globose, minute, smooth, not or very shortly pedicellate. (Description ex Berkeley, l.c., Massee, l.c., and Saccardo, l.c.)

Habitat : on the ground.

Distribution : South Africa.

South African specimens : Uitenhage, *Zeyher* 103.

Berkeley says of this species :—" This species, which is very peculiar, has more the appearance of a *Scleroderma* than of a *Lycoperdon*, though its structure is that of the latter. It resembles in some respects *L. caelatum*. The peridium is, however, more rigid, and opens, apparently, not by the mere collapsing of the centre, but by coarse cracks. It varies with a distinct stem, and is altogether confluent with the peridium; but even then, the distinction between the stem and peridium is marked".

***Lycoperdon natalense* Fries.**

Fungi Natalenses in K. Vet. Ak. Handl., Stockholm (1848) 150.

? *nomen nudum*.

The following note on this species was supplied by Miss Wakefield :—" Fries did not describe *Lycoperdon natalense* except for saying that it was near *L. caelatum* and differed in its vinaceous or pale purplish spores (this sounds like *Calvatia lilacina*) and if there is no specimen of *L. natalense* in Fries's herbarium at Upsala, by which it could be identified, I think the name may be regarded as a *nomen nudum* and in that sense Cooke and Massee were free to use it again".

With regard to *L. natalense* Cooke & Massee, G. H. Cunningham (Gastero. 1944 : 146) considers this species to be a synonym of *L. depressum* Bonord., which is the same as *L. hyemale* (Bull. ex Pers.) Vitt.

Excluded Species.

The following species, recorded as having been collected in Southern Africa, are considered to be synonyms of other species or genera and have been listed as such in the foregoing pages:—

<i>Lycoperdon atro-violaceum</i> Kalchbr.....	<i>L. Curreyi</i> Massec.
<i>L. ceparalforme</i> (Bull.) Mass.....	<i>L. polymorphum</i> Vitt.
<i>L. Curtisii</i> Berk.....	Prob. <i>L. hyemale</i> (Bull. ex Pers.) Vitt.
<i>L. cyathiforme</i> Bosc.....	<i>Calvatia lilacina</i> .
<i>L. depressum</i> Bon.....	<i>L. hyemale</i> (Bull. ex Pers.) Vitt.
<i>L. dermatoxanthum</i> Vitt.....	<i>L. pusillum</i> Batsch ex. Pers.
<i>L. Eylesii</i> Verwoerd.....	<i>L. hyemale</i> (Bull. ex. Pers.) Vitt.
<i>L. excipuliforme</i> (Scop.) Vitt.....	<i>L. perlatum</i> Pers.
<i>L. furfuraceum</i> Schaeff. ex de Toni.....	<i>L. polymorphum</i> Vitt.
<i>L. gemmatum</i> (Batsch) Fr.....	<i>L. perlatum</i> Pers.
<i>L. glabellum</i> Peck.....	<i>L. umbrinum</i> Pers.
<i>L. multiseptum</i> Lloyd.....	<i>L. hyemale</i> (Bull. ex Pers.) Vitt.
<i>L. natalense</i> Cooke Mass.....	<i>L. hyemale</i> (Bull. ex Pers.) Vitt.
<i>L. oblongisporum</i> Berk Curt.....	<i>L. polymorphum</i> Vitt.
<i>L. pratense</i> Pers.....	<i>L. hyemale</i> (Bull. ex Pers.) Vitt.
<i>L. radicum</i> Welw. Curr.....	<i>L. Curreyi</i> Mass.
<i>L. retis</i> Lloyd.....	<i>Calvatia candida</i> (Rostk) Holl�s (sec. G. H. Cunningham).
<i>L. saccatum</i> Vahl.....	<i>Calvatia saccata</i> (Vahl ex Fr.) Morgan.
<i>L. Welwitschii</i> de Toni.....	<i>L. Curreyi</i> Massec.
<i>L. MacOwani</i> (unpublished name) referred by Verwoerd in Ann. Univ. Stell. 3 (1925) 33 to <i>L. Welwitschii</i> de Toni.	

2. DISCISEDA Czernaiev.

Bulletin de la Soci t  Imperiale des Naturlistes de Moscou, 18 (1845) 153.

Catastoma Morgan, Journ. Cincinnati Nat. Hist. 14 (1892) 142.

Bovistoides Lloyd, Myc. Writ. 6, Myc. Notes 61 (1919) 883.

Type species ; *Disciseda collabescens* Czern.

Plants growing just below soil level or partially exposed. Peridium depressed-globose, consisting of two layers, an outer hyphal layer—the exoperidium—which becomes impregnated with sand and vegetable debris and at maturity breaks away circumscissilely, leaving an irregular, shallow, cup-shaped structure around the base, and an inner membranous, parenchymatous layer—the endoperidium—which surrounds the gleba and dehisces by means of a small aperture. Sterile base wanting. Gleba pulverulent. Capillitium threads short, simple or short-branched, non-septate. Spores coloured, globose, almost smooth to coarsely verrucose, pedicellate or not.

Cunningham has been followed in the arrangement of the key to the species.

Key to the Species.

Spores long-pedicellate (10 μ or more)

Spores coarsely verrucose.....	1. <i>D. pedicellata</i>.
Spores finely verrucose.....	2. <i>D. juglandis formis</i>.
Spores almost smooth.....	3. <i>D. castanea</i>.

Spores non-pediceolate or apiculate

- | | |
|---|-------------------------|
| Spores coarsely verrucose, verrucae flat-topped forming a halo..... | 4. <i>D. hypogaea.</i> |
| Spores echinulate with finger-like processes..... | 5. <i>D. verrucosa.</i> |
| Spores coarsely spinulose..... | 6. <i>D. Zeyheri.</i> |
| Spores finely verruculose | |
| Exoperidium thin, membranous..... | 7. <i>D. anomala.</i> |
| Exoperidium thick, brittle..... | 8. <i>D. cervina.</i> |
| Spores almost smooth, Gleba olivaceous-umber..... | 9. <i>D. candida.</i> |

1. *Disciseda pedicellata* (Morgan) Hollós, [Plate LXIV, fig. 3.]

Termesztetrajzi Füzetek 25 (1902) 103.

G. H. Cunningham, Gastero. (1944) 136.

Catastoma pedicellata Morg., Journ. Cincinnati Soc. Nat. Hist. 14 (1892) 143 ;

Verwoerd, Ann. Univ. Stell. 3 (1925) 27.

Peridium 3 cm. diam., depressed globose. *Exoperidium* fairly thick and hard, of sand and hyphae mixed, light greyish-brown, breaking away circumscissilely, leaving only a small basal cup not visible from the top. *Endoperidium* membranous, tough, umber (Natal Brown) in the lower half, paler brown (near Avellaneous) towards the apex, smooth, dull or shining, dehiscing by a torn, apical mouth. *Gleba* purplish brown, pulverulent. *Capillitium* threads abundant, tinted pale brown, smooth, spirally wavy, thinner than diameter of spores. *Spores* up to 10.2μ diam., including the verrucae, globose, coarsely verrucose ; verrucae rounded, brown ; pedicellate, pedicels up to 37.4μ , tinted, smooth, straight or curved.

Habitat : on the ground, solitary.*Distribution* : South Africa ; North America ; Australia.

Specimens examined : Maputa Expedition, Mocambique, Aug. 1914, *Dr. Breijer*, 8355 ; Knysna, *Duthie* 207 (v. d. Byl 1426 ex. Herb. Lloyd).

2. *Disciseda juglandiformis* (Berkeley) Hollós.

Hedwigia 42 (1903) 22.

Bovista juglandiformis Berk., Massee in Journ. Bot. (1888) 130.*Catastoma juglandiformis* (Berk.) Lloyd. Myc. Writ. 1, Myc. Notes 18 (1904) 199.

Peridium 2.5–3.7 cm. diam., subglobose, sessile. *Exoperidium* thick, persistent, cupulate at the base. *Endoperidium* polished, rigid, dark brown, mouth small, apical. *Gleba* olive-tinted rufous. *Capillitium* threads flaccid, pale, sparingly branched, much curled and intertwined. *Spores* brown, globose, minutely warted, about 16μ diam., pedicellate ; pedicels long, 60–70 μ , thick, reddish olive. (Description adapted from Berkeley l.c.)

Habitat : on the ground.*Distribution* : South Africa.

South African records : locality unknown, Type in Herb. Berk., No. 4584, Kew, as *Bovista juglandiformis* ; Brenton, Knysna, *Duthie* 153 (Lloyd, Myc. Coll. 52388).

According to Berkeley, l.c., this species is remarkable for the size of the spores and the very long, stout, coloured pedicels.

3. **Disciseda castanea** (Lév.) n. comb.

Bovista castanea Lév., Ann. Sci. Nat., ser. 3, 5 (1846) 162.

Catastoma castaneum (Lév.) Lloyd, Myc. Writ. 2, Myc. Notes 23 (1906) 291.

Peridium about 3 cm. diam., globose. *Exoperidium* not described. *Endoperidium* parchment-like, black, byssoid below. *Gleba* bright olive. *Capillitium* threads dense. *Spores* globose, smooth, with long pedicels. (Description ex Massee, l.c.)

Habitat: solitary or in groups, on ground.

Distribution: South Africa.

South African Records: between Hex River Mts. and the Bokkeveld, *Drège 9455a* (Herb. Mus. Paris and Herb. Delessert, Geneva, as *Bovista castanea* Lév.); under *Eucalyptus globulus*, Maritzburg, T. R. Sim, 8796 (specimen not found).

4. **Disciseda hypogaea** (Cooke & Massee) G. H. Cunningham.

Proceedings of the Linnean Society of New South Wales, 52 (1927) 240.

Bovista hypogaea Cke. & Mass., Grevillea 20 (1891) 35.

Catastoma hypogaeum (Cke. & Mass.) Lloyd, Myc. Writ. 1, Lyc. Aus. (1905) 27.

Peridium 9 mm. diam., depressed globose. *Exoperidium* falling away irregularly leaving a disc mixed with sand at base of plant. *Endoperidium* thin, flaccid, tough, greyish white, dehiscing by a mammosc mouth. *Gleba* greyish brown, pulverulent. *Capillitium* threads tinted, sparingly branched. *Spores* globose, 7–9 μ diam., including the spines, pale brown with darker episore, very closely and strongly verrucose, the tips of the verrucae spread out giving the appearance of a halo round the spores. (Description from a single specimen with weathered mouth.)

Habitat: in sandy soil.

Distribution: South Africa; Australia.

Specimen examined: eastern slopes of Bokkeveld, Aug. 1941, E. L. Stephens 562.

The species is characterised by the coarsely verrucose spores in which the flat-topped verrucae form a halo round the spores.

5. **Disciseda verrucosa** G. H. Cunningham, [Plate LXIV, fig. 4.]

Transactions of the New Zealand Institute 57 (1926) 205.

G. H. Cunningham, Gastero. (1944) 140.

Peridium 2.2 cm. (3 cm.) diam., depressed globose. *Exoperidium* pale brown (nearest Avellaneous) hard, consisting of hyphae mixed with sand, breaking away from the apical portion, leaving an irregular, persistent, cup-like structure around the base, extending about one third of the total height of the plant. *Endoperidium* brown (Bay Brown) or pale greyish brown, dehiscing by a definite mammosc pore (occasionally two) which becomes torn and irregular in old specimens. *Gleba* bay brown, pulverulent. *Capillitium* threads tinted brown, simple or occasionally short branched, non-septate, wavy, often spirally intertwined, thinner than diameter of spores. *Spores* 6.8–10.2 μ diam., including the verrucae, brown with darker episore, which is covered with coarse, hyaline echinulae.

Habitat: solitary, on ground.

Distribution: South Africa; Australia; New Zealand.

Specimens examined : Grahamstown, C.P., March 1934, *N. J. G. Smith* 221, 27511, det. Cunningham ; nr. Dordrecht, C.P., Feb. 1946.

The chief characteristics of this species are the definite mammose stoma in fresh specimens and the echinulate spores.

6. *Disciseda Zeyheri* (Berk.) Hollós.

Hedwigia 42 (1903) 22.

Bovista Zeyheri Berk., in Massee, Journ. Bot. 26 (1888) 130.

Catastoma Zeyheri (Berk.) Lloyd, Myc. Writ. 5 (1917) Letter 65, p. 8 ; Verwoerd, Ann. Univ. Stell. 3 (1925) 27.

Peridium up to 3.7 cm. diam., subglobose, often with a small rooting base. *Exoperidium* thick, ochraceous, cupulate and persistent below. *Endoperidium* pale brown, dark purple or cinnamon, minutely granular or powdery, dehiscing by a small mouth. *Gleba* umber. *Capillitium* threads tinted to brown, undulating to much curled, 2.6–3.4 μ diam. *Spores* globose, 6–8 μ diam., brown, finely verrucose.

Habitat : on ground.

Distribution : South Africa.

Specimen examined : Mossel Bay, v. d. Byl 731.

Specimens not seen : without locality, Type in Herb. Berk. No. 4588, Kew, as *Bovista Zeyheri* ; without locality, ? Knysna, Duthie.

7. *Disciseda anomala* (Cooke et Massee) G. H. Cunningham.

Gasteromycetes of Australia and New Zealand (1944) 139.

Bovista anomala Cooke et Massee, Grev. 18 (1889) 6.

Catastoma anomalum (Cooke et Massee) Lloyd, Myc. Writ. 1, Lyc. Aus. (1905) 27, 5 (1916) 610 ; Verwoerd, Ann. Univ. Stell. 3 (1925) 27.

Peridium up to 2 cm. wide, 1.5 cm. high, depressed-globose. *Exoperidium* brown, membranous, falling away, except at the base, where it persists as a small, irregular, sand-encrusted, cup-shaped structure. *Endoperidium* smoke or ash grey, membranous, thin but tough, smooth, obscurely furfuraceous, dehiscing either by a circular, flattened, tubular or mammose mouth. *Gleba* olivaceous, becoming umber, pulverulent. *Capillitium* threads pale brown, in short or fairly long segments with blunt ends, occasionally shortly branched, usually smooth, even and wavy, varying in thickness up to diameter of largest spore. *Spores* darker than capillitium threads, globose, but occasionally obovate or broadly oval, finely and closely or sparsely verruculose, 3.4–6 μ diam., very short pedicellate, short stumps only of pedicels remaining.

Habitat : solitary or in small groups on ground.

Distribution : Africa ; Australia.

Specimens examined : Mamathes, Basutoland, A. Jacot-Guillarmod, Oct. 1940, 34145 ; Phoenix, Natal, v. d. Byl 525 ; Durban, v. d. Byl 237.

Specimens not seen : without locality, Duthie.

This species is characterised by its thin, tough, membranaceous exoperidium, its finely verruculose spores and its tubular or mammose mouth.

According to Lloyd (Myc. Writ. 5, 1916 : 610) the South African form is not exactly the same as the usual Australian form, in that in the specimens examined by him (collected by A. V. Duthie) the mouth is mammose instead of tubular, the colour grey instead of rich brown and the spores smaller. In our No. 34145, however, not seen by Lloyd, the mouth is definitely tubular and the spores rather larger, up to 6 μ diam.

8. *Disciseda cervina* (Berkeley) Hollós.

Hedwigia 42 (1903) 22.

G. H. Cunningham, Gastero. (1944) 138.

Bovista cervina Berk., Ann. Nat. Hist. 9 (1842) 447 ; Sacc. Syll. Fung. 7 (1888) 100.

Catastoma magnum Lloyd, Myc. Writ. 5, Myc. Notes 45 (1917) 631 ; Verwoerd, Ann. Univ. Stell. 3 (1925) 27.

Peridium up to 2.5 cm., depressed globose. *Exoperidium* thick, breaking away circumscissilely, leaving an irregular, cinnamon brown, cuplike structure, composed of hyphae mixed with sand, at the base. *Endoperidium* thin, membranous, buff to pale tan coloured (Pinkish Buff, Cinnamon Buff) very finely granular, becoming smooth, dehiscing by a fimbriate, mammose mouth. *Gleba* olivaceous-brown. *Capillitium* almost hyaline to light brown, varying in thickness up to the diameter of the spores, for the most part smooth, occasionally simply and shortly branched, fairly straight. *Spores* globose, 5-6 μ diam., golden brown, finely verrucose, with stumps only of pedicels, epispore and wall of the single, conspicuous vacuole dark coloured.

Habitat : solitary, on ground.

Distribution : South Africa ; North America ; Australia ; Europe ; New Zealand.

Specimens examined : Schweizer Reinecke, Tvl., July 1929, *D. v. H.*, 34531.

Specimens not seen : near Cape of Good Hope (as *Bovista cervina*) ; Stellenbosch Flats, *Duthie* 282 (Lloyd Myc. Coll. 52392) ; under *Acacia caffra*, Commando Nek, Tvl., *I. B. Pole Evans* (Lloyd Myc. Coll. 52393) 8381 (specimen missing from Pretoria Herb.) ; Marienthall, S.W. Africa, *R. Marloth*, 26613.

The Australian plant as described by Cunningham, l.c., appears to be larger—up to 4 cm. diam.—with purplish or tan-coloured endoperidium and purplish or olivaceous gleba.

9. *Disciseda candida* (Schweinitz) Lloyd, [Plate LXIV, fig. 1, 2.]

Mycological Writings 1, Mycological Notes 10 (1902) 100.

Bovista candida Schw., Syn. Fung. Carol., No. 333 (1822).

B. circumscissa Berk. & Curt., Grev. (1873) 50.

Catastoma circumscissa Berk. & Curt., Morgan, Journ. Cincinnati Soc. Nat. Hist. 14 (1892) 143.

Disciseda circumscissa (Berk. & Curt.) Hollós, Term. Feuz. 25 (1902) 102.

Catastoma Duthiei Lloyd, Myc. Writ. 6 (1919) 891.

Peridium (dry plant) up to 2 cm. diam., depressed-globose. *Exoperidium* thick, hard, consisting of hyphae mixed with vegetable debris, breaking away circumscissilely, leaving a shallow, cuplike structure at the base. *Endoperidium* drab, ferruginous to umber, tough, covered by a very thin, whitish, membranous layer, which flakes off, leaving a thick, spongy layer, which splits into minute longitudinal fissures towards the base, just above the exoperidial cup ; dehiscing by an apical, fimbriate, mammose mouth. *Gleba* olivaceous-umber, pulverulent. *Capillitium* threads abundant, almost hyaline to pale brown, varying in thickness up to thicker than spore diameter, occasionally short-branched, smooth,

comparatively straight, wavy or angled. *Spores* 4–5 μ diam., globose, non-pedicellate or very shortly and inconspicuously pedicellate, pale brown with darker episore, almost smooth or finely and sparsely verruculose.

Habitat : solitary or in groups, on ground.

Distribution : South Africa ; North and South America ; Australia ; New Zealand.

Specimens examined : under *Acacia caffra*, Commando Nek, Brits Distr., April 1914, I. B. Pole Evans, 8381 ; without locality, A. V. Duthie, 31514 ; Forest Hall, Knysna, A. V. Duthie 224 (Stell. 225 ; Lloyd Myc. Coll. 52391, Type of *Catastoma Duthiei*) 31411 ; Phoenix, Natal, Oct. 1925, Hardenberg (N.H. 622) 31862.

Specimens not seen : Queenstown, Pope, Kew, det. N. J. G. Smith.

Three sketches of this species, supplied by Dr. Duthie, show (1) the rooted plant with complete exoperidium (2) the plant with exoperidium splitting circumscissilely and (3) the plant with the remains of the exoperidium on the basal, rooted portion.

3. CALVATIA Fries.

Summa Vegetabilium Scandinaviae, Part 2 (1849) 442, emended Morgan, Journal Cincinnati Society of Natural History 12 (1890) 165.

Hippoperdon Mont., Ann. Sci. Nat., ser. 2, 17 (1842) 121.

Globalia Quelet, Bull. Soc. Myc. Fr. 24 (1876) 370.

Utraria Quel., l.c., p. 366.

Hypoblema Lloyd, Myc. Writ. 1, Myc. Notes 14 (1903) 140.

Type species : *Calvatia craniiformis* (Schw.) Fr.

Plants epigeous, fairly small to very large. Peridium subglobose to pyriform, with or without a thick, short rooting base. Exoperidium thin, even, granular, areolated, furfuraceous, warted or spinulose, usually fugacious. Endoperidium thin, membranaceous, breaking away in irregular fragments from the apical portion. Gleba with sterile base or not, with or without a diaphragm. Capillitium threads long, or breaking up into short pieces, sparingly branched, septate or not. Spores globose or broadly elliptical, rough or smooth.

The genus *Calvatia* is most nearly related to *Lycoperdon* from which, however, it differs in the manner of dehiscence. Whereas *Lycoperdon* dehisces by means of an apical pore, *Calvatia* dehisces by the breaking away of the apical portion of the endoperidium.

Key to the Species.

Diaphragm present.

Spores smooth..... 1. *C. caelata*.

Spores verrucose..... 2. *C. lilacina*.

Diaphragm absent.

Plants large, up to 30 cm. diam.

Exoperidium smooth. Sterile base scanty, poorly developed..... 3. *C. gigantea*.

Exoperidium spinulose or granular.

Sterile base large, well developed..... 4. *C. saccata*.

Exoperidium tubercular or areolate with flattened warts. Sterile base absent..... 5. *C. lepidophora*.

Plants small, up to 7 cm. diam.

Exoperidium furfuraceous.

Sterile base present..... 6. *C. candida*.

Sterile base absent..... 7. *C. incerta*.

Exoperidium tomentose, scanty, not separable.

Sterile base absent..... 8. *C. pachyderma*.

Exoperidium of thick, pyramidal warts.

Sterile base absent..... 9. *C. macrogemmae*.

1. *Calvatia caelata* (Bulliard) Morgan, [Plate XLII, fig. 1.]

Journal of the Cincinnati Society of Natural History 12 (1890) 169.

G. H. Cunningham, Gastero. (1944) 156.

Lycoperdon caelatum Bull., Champ. 1 (1809) 156; Sacc. Syll. Fung. 7 (1888) 115, 481.

L. Fontanesii Dur. et Mont., Fl. Alger. 1 (1849) 381.

L. favosum (Rostk.) Bon., Bot. Zeitung 15 (1857) 595.

L. Sinclairii Berk. in Herb., ex Massee, Journ. Roy. Micr. Soc. (1887) 716.

Calvatia Fontanesii (Dur. et Mont.) Lloyd, Myc. Writ. 1, Lyc. Aus. (1905) 36.

C. Sinclairii (Berk.) Lloyd, l.c., p. 37.

C. bovista (Pers.) Kambly & Lee, Univ. Iowa Stud. Nat. Hist. 17 (1936) 138, non MacBride 1896.

Peridium 5-9.5 cm. diam., egg-shaped or depressed globose, narrowing abruptly into a short, thick, crenulate rooting base. *Exoperidium* thick, membranaceous or felted, apically granular or covered with large, pale brown to olivaceous brown, closely set, pyramidal warts, which break away at maturity leaving the endoperidium areolate. *Endoperidium* parchment-coloured, becoming thin and brittle, breaking when touched, minutely furfuraceous, but smooth to the naked eye, pentagonally areolate, caused by the falling away of the exoperidial warts. Dehiscence by the breaking away of the apical portion in pieces. *Sterile base* small, about one-sixth of the total height, but well differentiated and separated from the gleba by a well-developed diaphragm. *Gleba* ochraceous at first, finally olivaceous brown, becoming very pulverulent, disintegrating when handled. *Capillitium* threads olivaceous, usually thicker than diameter of spores, sparingly and dichotomously branched, septate, fragmenting at maturity. *Spores* 3.4-5 μ diam., globose to slightly obovate when shortly apiculate, smooth, tinted to brown, epispore and wall of large single vacuole dark.

Habitat: on the ground, occurring singly.

Distribution: North and South Africa; North America; Australia; Britain; Europe; New Zealand.

Specimens examined: Groenkloof, Pretoria, Nov. 1919, *E. P. Phillips* 12451.

This species is characterised by the finally areolate peridium, the well-defined sterile base and diaphragm and the smooth spores. The above specimens were identified by Lloyd as *C. Fontanesii* on account of the warts on the peridial wall.

2. *Calvatia lilacina* (Berkeley) P. Hennings, [Plate XLI, fig. 2, 3.]

Hedwigia 43 (1904) 205.

Lloyd, Myc. Writ. 1, Lyc. Aus. (1905) 35; Verwoerd, Ann. Univ. Stell. 3 (1925) 33; G. H. Cunningham, Gastero. (1944) 157.

Bovista lilacina Berk. et Mont., Hook. Journ. Bot. 4 (1845) 62.

Lycoperdon novae-zelandiae Lév., Ann. Sci. Nat. ser. 3, 5 (1846) 164.

L. lilacinum (Mont. et Berk.) Mass., Journ. Roy. Micr. Soc. (1887) 706.

L. violascens Cooke et Massee ex Massee l.c.

L. cyathiforme Bosc., Berl. Mag. d. Ges. naturf. Freunde 5 (1811) 87.

Peridium up to 11 cm. diam., subglobose or subpyriform, typical plants tapering abruptly into a well-developed, smooth or plicated base, attached by a short, thick, single or branched rooting structure. *Exoperidium* finely floccose, creamy white or ochraceous, finally chocolate, umber or bay brown (Cinnamon or Natal Brown) thin, fugacious, smooth, sometimes areolated. *Endoperidium* light greyish brown (near Wood Brown) sometimes with a metallic sheen, thin, fragile, breaking up and falling away in segments from the upper part, i.e. above the diaphragm. *Sterile base* usually well-developed, persistent, cellular, olivaceous, ochraceous or greyish to dark brown, separated from the gleba by a usually, but not always prominent diaphragm. *Gleba* ochraceous grey, finally purplish, dark grey with a purplish tinge or purplish brown, compact at first, becoming floccose and pulverulent and often completely disappearing. *Capillitium* threads long, but at maturity sometimes easily fragmenting at the septa, the pieces sometimes irregular and very much thickened, sparingly branched, uniform, tinged violaceous or ochraceous. *Spores* globose, faintly to strongly verrucose or spiny, 4-6.8 μ , tinted yellowish or bay brown, with dark epispore.

Habitat: solitary, on ground.

Distribution: South Africa; North America; Australia; Canada; Southern Europe; New Zealand.

Specimens examined: Maclear, C.P., *P. J. Pienaar*, 2134, det. Wakefield; Maputa, Mocambique, Aug. 1914, *Dr. Breijer*, 8361; Eagle's Nest, Bloemfontein, March 1917, *Geo. Potts* 7173, 13016; Pretoria, March 1925, *J. Wickens*, 20372, Nov. 1911, *P. J. Pienaar*, 1939, *A. O. D. Mogg*, 23640; Matatiele, C.P., *Gideon Joubert*, 26852; Stellenbosch, *Duthie* 40, 31312; Pietermaritzburg, Natal, Jan. 1915, *J. M. Sim*, 8796; Natal, *Medley Wood* 408, 11147 and Kew; Donnybrook, Natal, *E. M. Doidge*, 34538; Stella Bush, Durban, July 1917, *P. v. d. Byl* 543 (N.H. 695) 31901, *Indian Collector* (N.H. 477) 31769; Riviera, Pretoria, May 1916, *L. Kresfelder*, 9795; Llandudno, C.P., *E. L. Stephens*, 34573; Kirstenbosch, *L. Bolus* (v. d. Byl 1669) det. Lloyd; Rondebosch, C.P., *E. L. Stephens* 131; Kirstenbosch, *E. L. Stephens* 404; Cape Peninsula, *E. L. Stephens* 550, 565, 506.

Specimens not seen: near Boschberg, *MacOwan* 1004, 1009; Stella Bush, Durban, *Indian Collector*, 31769, Durban, *P. v. d. Byl*, 390, 391, 543; Stellenbosch Flats, *Duthie* 42, 121, 188 (v. d. Byl 816); Woodbourne, Knysna, *Duthie* 46, 116; edge of Rain Forest, Victoria Falls, S. Rhodesia, *Cheesman*.

This species is reported by Miss Stephens to be the commonest puff-ball in the South-western Cape Province. It is recognised by the purplish colour of the gleba, the persistent sterile base, which often remains attached to the substratum after the upper part has disintegrated and is often the only part collected, the large, verrucose spores and the very fragile nature of the mature plant. The diaphragm is not always easily distinguishable.

3. *Calvatia gigantea* (Batsch ex Persoon) Lloyd, [Plate XLIV, fig. 1.]

Mycological Writings 1, Mycological Notes 16 (1904) 166.

G. H. Cunningham, *Gastero.* (1944) 158.

Lycoperdon giganteum Batsch ex Pers. Syn. Meth. Fung. (1801) 140.

Bovista gigantea (Batsch ex Pers.) Nees, Syst. Pilze (1817) 34.

Lycoperdon bovista Fr., Syst. Myc. 3 (1829) 29.

Calvatia maxima (Schaeff.) Morg., Journ. Cin. Soc. Nat. Hist. 12 (1890) 166.

C. bovista Macbride, Bull. Lab. Nat. Hist. Univ. Iowa 4 (1896) 41.

C. primitiva Lloyd, Myc. Writ. 1, Lyc. Aus. (1905) 36.

"*Peridium* subglobose, to 40 cm. diam., sessile, with a strongly developed, cord-like basal rhizomorph, brown, thin, fragile, flaking away irregularly, exterior smooth, finely tomentose, resembling chamois leather, cream or yellowish, fugacious; *sterile base* scanty and poorly developed, compact, frequently wanting; *diaphragm* absent. *Gleba* yellowish, becoming olivaceous, semi-compact; *capillitium* threads long, sparingly branched, septate, olivaceous. *Spores* 4-6 μ diameter, epispore olivaceous, 0.75 μ thick, covered with a delicate, hyaline, gelatinous exospore, which often appears delicately verruculose; briefly pedicelled." (Description after Cunningham, l.c.)

Habitat : on ground on hills.

Distribution : South Africa; North America; Australia; Europe; India; New Zealand.

South African Record : outside Cape Town, *Thunberg*.

This species is distinguished by its large size, leathery peridium, verruculose spores and absence of a well-developed sterile base. No specimens have been available for examination.

4. *Calvatia saccata* (Vahl ex Fries) Morgan,

North American Fungi, Journal Cincinnati Society of Natural History XII, p. 171.

Sacc. Syll. Fung. 7 (1888) 128.

Lycoperdon saccatum Vahl., Fl. Dan. t. 1139; Kalchbrenner, Grev. 10 (1882) 108;

Sacc. Syll. Fung. 7 (1888) 128.

Peridium 2.5-5 cm. wide, 7.5-12.5 cm. high, depressed globose, turbinate or abruptly narrowed into a stalk-like base; base thick, 2.5 cm. or thicker, stumpy, often pitted, attached by mycelial threads. *Exoperidium* very thin, consisting of erect spines or granules, which largely disappear. *Endoperidium* white or greyish, later brownish, very thin and fragile, at maturity breaking away from the upper portion in areolate fragments. *Gleba* persistent—a spongy, cotton wool-like mass. *Sterile base* present, large, occupying the stalk-like base. *Diaphragm* absent. *Capillitium* threads brownish-olivaceous, long, sparingly branched, thinner than, or seldom as thick as the spore diameter, branches thinner. *Spores* fuscous, warty or spiny when mature, 4-6 μ diam., often pedicellate; pedicels thin, hyaline, 10-16 μ long. (Description from two specimens ex Herb. Dr. L. Hollós.)

Habitat : on ground.

Distribution : South Africa; North America; Britain; Europe.

South African Record : in wooded country, near Somerset East, *MacOwan*.

This species is said to be a very variable plant with many varieties. *MacOwan's* specimens were not available for examination, therefore it is impossible to say if these are the same plant as that described above.

5. *Calvatia lepidophora* (Ellis) Lloyd, [Plate XLII, fig. 2; XLIII.]

Mycological Writings 2, Notes to Index, No. 13 (1905-1908) 14.

Coker and Couch, Gastero. (1928) 60.

Lycoperdon lepidophorum Ell. et Everh., Myc. (1885) 88, non Peck.

Bovista lepidophora (Ell. et Everh.) de Toni, Sacc. Syll. Fung. 7 (1888) 1033.

Calvatia pachyderma Morgan.

Hypoblema pachyderma Llöyd, Myc. Writ. 1, Gen. Gaster. (1902) Pl. 11, fig. 49.

Hypoblema lepidophora Lloyd, Myc. Writ. 1, Myc. Notes 14 (1903) 140, Pl. 14.

Peridium epigeous, depressed globose or obovate, 4.5–13 cm. wide, 4.5–7 cm. high, sessile, with a thick, cordlike rooting structure. *Exoperidium* up to 1 mm. thick, firm, brittle, shell-like when dry, sometimes fairly smooth but usually rough, finely tubercular, or divided into large, flattened, wart-like areolae, white at first, finally dirty white or tan, caducous, splitting into sections which drop off, exposing the endoperidium. *Endoperidium* pale tan (Ochraceous Tawny, Sayal Brown, Tawny) thin, membranous, smooth to finely floccose, like kid leather to the touch, completely enclosing the compact gleba, finally breaking away. *Sterile base* wanting. *Gleba* greenish yellow, becoming brownish-olivaceous, pale tan or umber, forming a soft, spongy, compact mass, which remains intact for a long time, but finally disintegrates from the outside inwards, due to the fragmenting of the capillitium threads. *Capillitium* threads abundant, closely intertwined, long, thick-walled, septate, fragmenting, sparingly branched, usually at a wide angle, greenish yellow to pale olive brown, varying in thickness up to $10.2\ \mu$ diam. *Spores* globose, tinted greenish to umber, finely verruculose, $3.5\text{--}4.5\ \mu$ diam., often with a conspicuous central or excentric gutta.

Habitat : on sandy soil, usually solitary.

Distribution : South Africa ; North America.

Specimens examined : Garstfontein, Pretoria, April 1911, *P. J. Pienaar*, 1468 ; Meintjes Kop, Pretoria, May 1920, *I. B. Pole Evans*, 13795 ; Rietfontein, Pretoria, April 1921, *Venter*, 14638 ; Matatiele, C.P., June 1935, *Gideon Joubert*, 28534.

This species is very near *C. macrogemmae* but is a larger plant and has a less warty exoperidium. It differs from *C. gigantea* mainly in texture and in having a thick, rough exoperidium. From *C. caelata* it differs in the lack of a sterile base and diaphragm and in having a compact gleba.

Specimens of No. 28534 were sent to Lloyd for identification and were originally named by him *Hypoblema lepidophora*. Later he decided that they were the same as *Calvatia lepidophora*.

6. *Calvatia candida* (Rostkovius) Hollós, [Plate XLI, fig. 1.]

Termeszetrájsi Füzetek 25 (1902) 112.

Langermannia candida Rostk., Sturm. Deutsch Krypt. Flora 3 (1837) 25.

Bovista tunicata Bon., Bot. Zeit. 15 (1857) 597.

Lycoperdon candidum (Rostk.) Bon., Sacc. Syll. Fung. 7 (1888) 483.

Bovista olivacea Cooke et Mass., Journ. Bot. 26 (1888) 133.

Calvatia olivacea (Cooke et Mass.) Lloyd, Myc. Writ. 1, Lyc. Aus. (1905) 37.

Lycoperdon retis Lloyd, Myc. Writ. 7, Myc. Notes 68 (1923) 1176.

Peridium up to 6 cm. high, 5.5 cm. wide, pyriform, usually narrowing abruptly to a thick, strongly rooting base, smooth above but often crenulate at base. *Exoperidium* greyish-brown, furfuraceous, fugacious. *Endoperidium* becoming very thin, papery, smooth warm brown (between Tawny and Sayal Brown) at maturity breaking away in segments

from the apical part, exposing the spongy, interwoven gleba, which resembles a ball of brown cotton wool. *Gleba* persistent, brown (nearest Tawny Olive) or pale brownish-olivaceous (nearest Old Gold and Isabella) soft and spongy, remaining compact until it disintegrates. *Sterile base* well developed, cellular, whitish at first, finally brown or olivaceous brown. *Diaphragm* absent. *Capillitium* threads abundant, closely interwoven, equal, up to size of spore diameter, but usually smaller, tinted to olivaceous brown, sparsely if septate, sparingly branched, sometimes punctate. *Spores* tinted, olivaceous or hyaline, yellow ochre in mass, globose, 3.4–5 μ diam., occasionally up to 6.8 μ , finely verrucose, often apiculate.

Habitat : on ground, solitary or caespitose.

Distribution : South Africa ; Australia ; Europe.

Specimens examined : under *Eucalyptus* trees, Pietermaritzburg, April 1911, *I. B. Pole Evans* (Lloyd Myc. Coll. 34259) 1342, Kew ; in bush, Bulwer, Natal, *W. G. Rump* 467, 34523 ; Pietermaritzburg, *J. M. Sim*, 10052, *W. G. Rump* 710, Rietfontein, Pretoria, *Venter*, 14638.

Specimens not seen : without locality, *Duthie* (Lloyd, Myc. Coll. 51765).

7. *Calvatia incerta* n. sp., [Plate XXXIX, 4th row.]

Peridio 3–7 cm. lato, 3–6 cm. alto, obovato, subglobose, supra depresso, nitente, superne leve basi valide plicata, in humida tempestate rubro, pallescente celeriter vel in tempestate siccitate metallico badio, breve radicato. *Exoperidio* siccii fungi olivaceo, furfuraceo, evanescente vel in vetustate saepe squamulis albidis minimis persistente. *Endoperidio* rubro vel olivaceo-umbrino, leve tenui, fragili, membranaceo, in maturitate supra mox in fragmenta irregulariter dehiscente et decidente. *Gleba* umbrina vel olivacea, denum pulverulenta. *Basi sterili* absente. *Capillitio* subhyalino dein dilute olivaceo ; floccis densissimis, plerumque levibus aequabilibusque, undulatis, vix ramosis, ad septa secedentibus, 3.4–8.5 μ diam. *Sporis* globosis, nonnunquam breviter pedicellatis, 3–4 μ diam.

Hab. in locis graminosis apud pluviam multam, Benoni, leg. *L. Bailéy*, 27339.

Peridium 3–7 cm. wide, 3–6 cm. high, obovate, subglobose, depressed at apex, shining, smooth above, strongly plicate at base ; fresh plants scarlet in wet weather, the red colour soon fading, metallic bay brown in dry weather ; attached by a short, thick rooting structure. *Exoperidium* of dry weather plant olivaceous, furfuraceous, disappearing, or often remaining as minute, whitish specks on old plants. *Endoperidium* scarlet or olivaceous-brown, depending on weather conditions, smooth, thin, very fragile, membranaceous, dehiscing by breaking away in irregular sections from the apical part. *Gleba* bay brown or olivaceous, pulverulent, soon disintegrating. *Sterile base* lacking. *Capillitium* threads sub-hyaline to pale olivaceous, abundant, fragmenting, usually smooth and uniform, wavy, occasionally branched, 3.4–8.5 μ diam. *Spores* globose, sometimes shortly apiculate, 3–4 μ diam.

Habitat : on grassy slopes after continuous rain.

Distribution : South Africa.

Specimens examined : Benoni, Tvl., Nov. 1933, *L. Bailey*, 27339.

From a photograph and description of the above plant, Dr. G. H. Cunningham was unable to connect it with any known species ; the specimen sent to him unfortunately did not reach its destination.

8. *Calvatia pachyderma* (Peck) Morgan. [Plate XLIV, fig. 2.]

Journal of the Cincinnati Society of Natural History (1889) 167.

Coker and Couch, Gastero. (1938) 60.

Lycoperdon pachyderma Peck, Bot. Gaz. 7 (1882) 54.

Peridium 7.5 cm. diam., subglobose, attached by a single, thick rooting structure, partly submerged in sand. *Exoperidium* dirty white, scanty, tomentose, mixed with sand, disappearing in patches, not separable from the endoperidium. *Endoperidium* fairly thick, up to 1 mm., hard, corky, dirty white or pale brown, smooth, persistent for a long time; dehiscence not seen but presumably by the breaking up of the apical part into segments. *Gleba* bright yellowish-olivaceous (between Sulphur Yellow, Honey Yellow and Isabella colour). *Sterile base* lacking. *Capillitium* threads almost hyaline to pale yellowish green, branched, septate, soon fragmenting, wavy, fairly uniform, thickness up to diameter of largest spores. *Spores* globose, concolorous or darker, finely verrucose, 4-6 μ diam.

Habitat : solitary, in sandy soil.

Distribution : South Africa ; North and South America ; Catalina Island.

Specimen examined : Cape Province, ? *E. L. Stephens*, 34143.

This plant is said to very much resemble *Mycenastrum corium* with its hard, thick, smooth, light-coloured peridium, but differs in having long, branched capillitium threads without spines.

The identification of the above specimen is not at all certain, as only one plant was available for examination. When this genus was studied, war conditions were such that it was impossible to send specimens to the United States for Dr. Coker's opinion.

9. *Calvatia macrogemmae* Lloyd.

Mycological Writings 7, Mycological Notes 68 (1922) 1122 and (1923) 1109.

Verwoerd, Ann. Univ. Stell. 3 (1925) 33.

Peridium epigeous, 5 cm. diam., depressed-globose. *Exoperidium* woody, consisting of large, thick, wart-like scales, which probably disappear with age. *Endoperidium* pale brown, thin, membranaceous, brittle, smooth. *Sterile base* lacking. *Gleba* olivaceous. *Capillitium* threads long, septate, branched, hyaline, 1.7-6.8 μ diam. *Spores* irregularly globose or ellipsoid, smooth, hyaline to tinted, 3.3-4.4 \times 4.4-5 μ . (Description translated from Verwoerd, l.c.)

Habitat : on ground amongst grass.

Distribution : South Africa.

Specimens examined : Natal, *J. Thode* (v. d. Byl 505).

Specimens not seen : without locality, v. d. Byl 80 (Lloyd Myc. Coll. 22585) Type.

4. *LANOPILA* Fries.

Fungi natalenses in K. Vetensk. Akad. Handlingar, Stockholm (1848) 151.

Lloyd, Myc. Writ. 1, Myc. Notes 8 (1904) 190, Myc. Writ. 7 (1923) 1177 ; Verwoerd, Ann. Univ. Stell. 3 (1925) 24 ; Ed. Fisch., Nat. Pflanz. 7a (1933) 64.

Type Species : *Lanopila Wahlbergii* Fr.

Peridium superficial, sessile, more or less globose, becoming detached at maturity. *Endoperidium* thin, papery, brittle, finally dehiscing irregularly. Gleba a compact, elastic mass, consisting of long, intertwined capillitium threads and globose spores. Sterile base lacking.

This genus was proposed by Fries for a specimen sent to him from South Africa by Wahlberg. According to Lloyd, l.c., it differs from *Bovista* only in the capillitium, which in *Lanopila* consists of long interwoven threads and in *Bovista* of short, separate threads. On the other hand, there appears to be no strict dividing line between this species and those species of *Calvatia* in which the sterile base is lacking and the capillitium threads form a compact spongy mass.

Key to the Species.

Spores verrucose.....	1. <i>L. Wahlbergii</i> .
Spores smooth.	
Capillitium threads smooth.....	2. <i>L. Radloffiana</i> .
Capillitium threads punctate.....	3. <i>L. capensis</i> .

1. *Lanopila Wahlbergii* Fr., [Plate XLV.]

Fungi Natalenses (1848) 151.

Sacc. Syll. Fung. 7 (1888) 95; Lloyd, Myc. Writ. 5, Letter 66 (1917) 8, Note 583, Myc. Writ. 7 (1923) 1177; Verwoerd, Ann. Univ. Stell. 3 (1925) 25.

L. bicolor (Lév.) Pat., Champignons de la Guadeloupe, Bull. Soc. Myc. Fr. 15 (1899) 191; Sacc. Syll. Fung. 16 (1902) 240; Lloyd, Myc. Writ. 1, Notes 18 (1904) 180.

Bovista bicolor Lév., Ann. Sci. Nat. ser. 3, 5 (1846) 162; Sacc. Syll. Fung. 7 (1888) 102.

Peridium 6-6.5 cm. wide, 5-5.5 cm. high, depressed globose or subglobose, breaking away from its point of attachment at maturity. *Exoperidium* thin, smooth except for adherent grains of sand, fragile, membranaceous, falling away from the endoperidium in small pieces, brown (between Sayal Brown and Russet) firmly adherent to endoperidium. *Endoperidium* deep ochraceous or light buff (Clay to Light Buff) smooth, like kid leather to the touch, thin, fragile, membranaceous, long permanent, finally cracking into small areas which break away. Gleba compact, somewhat resembling cotton wool, floccose, greyish brown (Buffy Brown, Snuff Brown). *Capillitium* abundant, threads long, interwoven, branched, almost hyaline to deep olivaceous, smooth, sparsely septate, thickness variable, less than to greater than diameter of spores. Spores dark brown, globose, finely or strongly verrucose, 5-7 μ diam.

Habitat: solitary in sandy soil.

Distribution: South Africa; South America; Belgian Congo; Ceylon; Cuba; India; West Indies; Mexico.

Specimens examined: Durban, April 1919, A. M. Bottomley, 12254; near Mafeking, C.P., Sept. 1934, I. B. Pole Evans, 27500; Durban, n. d. Byl 314.

Specimens not seen: Durban, Wahlberg; Knysna, C.P., Duthie 241 as *L. bicolor*.

In specimen No. 27500, the brown exoperidium is present on the basal half, forming a distinct contrast with the light buff coloured upper half. Such a specimen well justifies Lévillé's specific name "*bicolor*".

2. *Lanopila Radloffiana* Verwoerd.

Annale Universiteit Stellenbosch 3 (1925) 25.

Peridium 3 cm. diam., superficial, more or less globose, slightly pointed at the base. Sterile base wanting. *Exoperidium* single, smooth, more or less papery, pale amber, falling

away and exposing an amber coloured gleba. *Capillitium* threads long, 1.7–3.4 μ diam., more or less hyaline, branched, intertwined and forming a homogeneous, elastic mass, septate, slightly enlarged at the septa, smooth. *Spores* globose, smooth, light coloured, 3.4–3.8 μ diam. (Description translated from that of Verwoerd, l.c.)

Habitat : solitary in sandy soil.

Distribution : South Africa.

Specimen examined : Winburg, O.F.S., Miss Radloff (v. d. Byl 1439) *Type*.

This is the only collection on record.

3. *Lanopila capensis* Lloyd.

Mycological Writings 7, Mycological Notes 68 (1923) 1177.

Verwoerd, Ann. Univ. Stell. 3 (1925) 25.

Peridium 3.5 cm. diam., superficial, more or less globose, with a small, sterile base. *Exoperidium* single, smooth, thin, papery, brown. *Gleba* dark brown. *Capillitium* threads long, up to 7.2 μ diam., brownish-olivaceous, usually finely punctate and with a watered appearance, septate but fragmenting at the septa, sparsely branched. *Spores* 3.4–4.5 μ diam., globose, often with a short pedicel, almost hyaline to light brownish-olivaceous with a dark wall, smooth or subtly verruculose, usually with one large central or excentric dark bordered vacuole. (Description ex Verwoerd, l.c.)

Habitat : Solitary, in sandy soil.

Distribution : South Africa.

Specimen examined : Papegaaisberg, Stellenbosch, C.P., June 1921, *Duthie* 304, 31472, part of *Type* (Lloyd Myc. Coll. 7567, *Type*).

The species is recognised by the punctate, watered appearance of the capillitium threads.

BOVISTA Dillenius ex Persoon.

Synopsis Methodica Fungorum (1801) 136.

Globaria Quel., Mém. Soc. Emulat. de Montbéliard 2 Sér. 5 (1871–75) 370.

Sackeu Rostk., in Sturm, Deutschl. Flora, III Abt., 5 (1839) 33.

Bovistella Morgan, Journ. Cincinnati Soc. Nat. Hist. 14 (1892) 145.

Type Species : *Bovista plumbea* Pers.

Plants globose, subglobose or pyriform, provided or not with a well-developed rooting base, becoming detached or not from the substratum at maturity. *Exoperidium* thin, fragile, partially or entirely disappearing at maturity. Endoperidium thin, firm, often metallic-looking, smooth or finely warted, dehiscing by an apical pore. Sterile base present or absent. *Capillitium* of free threads, each consisting of a thick stem which branches dichotomously or irregularly into thinner, acuminate branches. *Spores* coloured, globose, obovate or elliptical, smooth or rough, pedicellate or not.

The characteristic feature of this genus is the capillitium threads, which consist of a thick stem with usually dichotomous branches.

In his recent work on the Gasteromycetes (1944) 142 Cunningham rejects the genus *Bovistella* on the grounds that collections of *Bovista brunnea* and *Bovistella bovistoides*

examined by him could be placed under either genus, since plants in the same collection may be with or without a rooting base and growing attached or free. He therefore sinks Morgan's genus *Bovistella* under *Bovista* Dill. ex. Pers. Cunningham's arrangement is followed here.

Key to the Species.

Spores broadly oval, $4 \times 6 \mu$	1. <i>B. oblongispora</i> .
Spores globose, $3-5.2 \mu$	
Endoperidium yellow	2. <i>B. citrina</i> .
Endoperidium brown	3. <i>B. umbrina</i> .

1. *Bovista oblongispora* (Lloyd) n. comb.

Bovistella oblongispora Lloyd, Myc. Writ. 5, Myc. Notes 45 (1917) 632; Verwoerd, Ann. Univ. Stell. 3 (1925) 29.

Peridium 1-2 cm. diam, subglobose. *Exoperidium* furfuraceous. *Endoperidium* thin. *Gleba* compact, olive then umber. *Sterile base* wanting. *Capillitium* threads deep coloured, long, intertwined, much branched, about 3μ diam. *Spores* $4 \times 6 \mu$, oblong, deep coloured, smooth, with a short, thick, permanent, subhyaline pedicel, 4-5 μ long. (Description ex Lloyd, l.c.).

Habitat : on ground.

Distribution : South Africa.

South African Record : Belvidere, Knysna, Duthie 99 (Lloyd Myc. Coll. 30756, *Type*). No specimen was lodged in any South African Herbarium.

2. *Bovista citrina* (Berkeley & Broome) n. comb.

Lycoperdon citrinum Berk. & Broome, Journ. Linn. Soc. 14 (1873) 80.

Bovistella citrina (Berk. & Br.) Lloyd in Petch, Ann. Roy. Bot. Gard., Peradeniya 7 (1919) 71.

Peridium up to 4 cm. diam., globose or depressed globose, sometimes lacunose below, usually arising from a stout, cord-like mycelium. *Exoperidium* delicate, of minute white spines or warts, which may disappear or persist in the form of minute warts. *Endoperidium* becoming thin and papery, lemon yellow, pale towards base; old specimens dark red-brown when moist, drying to dark shining olive, covered with minute, deep red-brown, or almost black warts. *Gleba* olive. *Sterile base* wanting. *Capillitium* threads yellow-brown, stout, thick-walled, 3-10 μ diam., branching usually at a wide angle, with occasional septa above the forks. *Spores* globose, 3-4 μ diam., pale olive, very minutely echinulate, with hyaline pedicels up to 16 μ long.

Habitat : on ground.

Distribution : Ceylon; South Africa.

South African specimens : Salisbury, S. Rhodesia, Eyles 7219, 7221, Kew.

This species is characterised by the lemon yellow colour of the endoperidium of the growing plant and the inconspicuous, very delicate exoperidium of minute white spines or warts.

3. *Bovista umbrina* n. sp.

Peridio subgloboso 2.5-3 cm. diam., basi valde radiceformi, 1-1.5 cm. diam. praedito. *Exoperidio* umbrino, in siccitate fere toto evanescente vel minimis floccis squamulis in depressionibus obscuris persistente. *Endoperidio* umbrino; plumbeo-purpureo tincto,

tenui, levi, ostiolo lacero, usque 6 mm. diam. dehiscendi, basi sterili nulla. *Gleba* purpureo-umbrina. *Capillitio* e filamentis pallide usque valde brunneis, plus minusve dichotomiramosis, levis, 2-10·2 μ diam. formato. *Sporis* globosis, late ellipsoidis v. obovatis umbrinis, levis vel obscure verruculosus, 3-5·2 μ diam., pedicellatis, pedicellis tenuibus, obscure coloratis, usque ad 18·7 μ longis.

Hab. in sylvis, Woodbush, Zoutpansberg, leg. Noel Roberts, 5659.

Peridium subglobose, 2·5-3 cm. diam., attached by a well-developed, subglobose to obconical rooting base 1-1·5 cm. diam. *Exoperidium* umber brown, either disappearing entirely or persisting as minute, floccose scales seated in small, closely set, areolate depressions hardly visible to the naked eye. *Endoperidium* between Bone Brown and Fuscous, with a purplish metallic sheen, thin, smooth to faintly pitted, dehiscing by an irregular torn mouth, up to 6 mm. across. *Sterile base* absent. *Gleba* chocolate brown with a purplish tinge (nearest Mars Brown). *Capillitium* threads pale to dark bay brown, sparsely to freely branched, smooth, thick-walled, 2-10·2 μ diam. *Spores* globose, broadly oval or obovate, dark brown, 1-vacuolate, smooth or obscurely verruculose, 3-5·2 μ diam., pedicellate. Pedicels tinted, slender, slightly acuminate, long, up to 18·7 μ .

Habitat : in forest.

Distribution : South Africa.

Specimens examined : Woodbush, Zoutpansberg, Tvl., Jan. 1913, Rev. N. Roberts, 5659.

I am indebted to Mr. P. H. B. Talbot for comparing this species with other *Bovista* species at Kew and for the following note :—"In colour this species is near *B. plumbea*, *B. nigrescens*, *B. ovalispora* and *B. brunnea* but is distinct from all these by the possession of a finely warted peridium and by spores with longer and stouter pedicels apart from any other considerations. Kew has no specimens of *B. purpurea* which, by its description in Cunningham's 'Gasteromycetes of Australia and New Zealand' is close to No. 5659, but possesses a smooth peridium." On Miss Wakefield's suggestion, the South African plant has been described as a new species.

MYCENASTRUM Desvaux.

Annales des Sciences Naturelles Sér. II, 17 (1842) 143.

Endoneuron Czern., Bull. Soc. Imp. Nat., Moscou 18 (1845) 151.

Pachyderma Schulz, Verh. Zool. Bot. Ges. Wien 25 (1875) 79.

Type Species : *Mycenastrum corium* (Guers.) Desv.

Peridium subglobose, obovate or irregular when caespitose, up to 20 cm. across ; outer wall consisting of two layers, a thin, floccose, deciduous exoperidium and a thick, hard, sub-woody endoperidium which dehisces in a stellate manner or by the breaking away of portions of the upper parts of the plant ; attached to the ground by a thick root-like structure from which it soon becomes detached. *Gleba* greenish yellow, olivaceous, finally umber, pulverulent. *Capillitium* threads coarse, abundant, short with acuminately pointed ends, branched, non-septate, all parts covered with short, spiny processes. *Spores* globose or broadly elliptical, brown, nearly smooth to coarsely echinulate.

This genus contains a single cosmopolitan species, of which the original plant came from France and was named *Lycoperdon corium* by Guersent in 1815. The plant very much resembles a *Scleroderma* in outward appearance and has often been mistaken for it, but the characteristic spiny capillitium serves to distinguish it from this genus. Other distinguishing features are the sub-woody endoperidium and the method of dehiscence.

Mycenastrum corium (Guersent ex D.C.) Desvaux, [Plate LXV.]

Annales des Sciences Naturelles, Sér. II, 17 (1842) 147.

Berkeley, Hook. Lond. Journ. Bot. 2 (1843) 418 ; Verwoerd, Ann. Univ. Stell. 3 (1925) 26 ; G. H. Cunningham, Gastero. (1944) 135.

Lycoperdon corium Guers., D.C., Fl. Fr. suppl. 2 (1815) 598.

Bovista suberosa Fr., Syst. Myc. 3 (1829) 26.

Scleroderma corium Grev., Duby, Bot. Gall. 2 (1830) 892.

Mycenastrum phaeotrichum Berk., Hook. Journ. Bot. 2 (1843) 418.

M. chilense Mont., Ann. Sci. Nat., Ser. 2, 20 (1843) 375.

Endoneuron suberosum Czern., Bull. Soc. Imp. Moscou 18 (1845) 152.

Sterrebeckia Geaster Fr., Fung. nat. (1848) 30.

Mycenastrum leptodermeum Dur., Fl. Alg. (1849) 386.

M. radiculatum Dur., l.c., p. 387.

M. Beccarii Pass., Nuov. Giorn. 7 (1875) 183.

Pachyderma Strossmayeri Schulz, Verh. Zool. Bot. Ges., Wien, 25 (1875) 79.

Mycenastrum clausum Schulz, Mycol. Beitr., Zool. Bot. Ges. Wien 27 (1877) 114.

Bovista spinulosa Peck, Bot. Gaz. 3 (1879) 170.

Mycenastrum spinulosum Peck, 33rd Rept., Bot. Gaz. 6 (1883) 240.

M. olivaceum Cooke et Massee, Grev. 16 (1887) 33.

Scleroderma phaeotrichum (Berk.) de Toni, Sacc. Syll. Fung. 7 (1888) 139.

S. chilense (Mont.) de Toni, Sacc. Syll. Fung. 7 (1888) 139.

S. spinulosum (Peck) de Toni, Sacc. Syll. Fung. 7 (1888) 141.

S. radiculatum (Dur.) de Toni, Sacc. Syll. Fung. 7 (1888) 141.

S. leptodermeum (Dur. et Mont.) de Toni, Sacc. Syll. Fung. 7 (1888) 141.

S. Beccarii (Pass.) de Toni, Sacc. Syll. Fung. 7 (1888) 142.

S. olivaceum (Cooke et Mass.) de Toni, Sacc. Syll. Fung. 7 (1888) 142.

Peridium globose, subglobose, obovate or irregular when caespitose, often plicate at the base, up to 14 cm. across unexpanded, 20 cm. expanded, attached by a thick, rootlike structure, from which it soon breaks away and tumbles in the manner of a *Bovista*. *Exoperidium* whitish, floccose, slowly fugacious. *Endoperidium* 2-5 mm. thick, smooth, greyish or parchment colour, finally umber brown, at maturity usually splitting from the apex downwards into unequal rays, the apices of which usually bend back and often become recurved, or breaking away in pieces from the upper portion. *Gleba* without sterile base, greenish-yellow, becoming olivaceous then umber, pulverulent but remaining intact for some time after expansion of the endoperidium. *Capillitium* threads abundant, thick, up to at least 14 μ diam., hyaline to yellow-olivaceous or olive brown, short, pointed at the ends, sparsely to freely short-branched, sometimes in a dichotomous manner, all parts, but especially the ends, thickly, or only occasionally covered with short, thorn-like; simple or branched spines. In immature specimens, the capillitium is mixed with tramal remains and hyaline to brown, simple or branched hyphae which occur singly or in strands. *Spores* globose or broadly oval, 10.2-13.6 μ , dark brown or lighter, with a thick, dark wall, almost smooth to coarsely echinulate-reticulate.

Habitat : on the ground, occurring singly, in small groups or caespitose

Distribution : South Africa ; North America ; Asia ; Australia ; Europe ; India ; New Zealand.

Specimens examined : near Platrivier, Pretoria Distr., Nov. 1913, *P. J. Pienaar*, 9305 ; Burghersdorp, April 1916, *Gideon Joubert*, 9687 ; Sevenfontein, nr. Swellendam, *I. B. Pole Evans*, 12178 ; Pretoria, *I. B. Pole Evans*, 12899 ; Irene, May 1927, *I. B. Pole Evans*, 21927 ; near Grahamstown, Nov. 1929, *Hewitt*, 24899 ; Marikana, Rustenburg Distr., Tvl., March 1932, *A. M. Bottomley*, 26638 ; nr. Heidelberg, Tvl., May 1937, *J. M. Murray*, 28819 ; Port Elizabeth, Dec. 1936, *E. Haslem*, 28863 ; Brenton, Knysna, *A. V. Duthie* 319, 31484, 321 (v. d. Byl 1089), 31503 ; banks of Limpopo River, west of Messina, *I. B. Pole Evans*, 33244 ; Huisrivierberg, CP., Jan. 1923, v. d. Byl 1071 as *Myriostoma coliformis* ; Stellenbosch, *D. Loseby* (E.L.S. 84)

Specimens not seen : nr. Uitenhage, *Zeyher* 90 ; on ground, Durban, *Wahlberg* ; Ermelo, *Brink* (v. d. Byl 1094) ; Clanwilliam, *Duthie* 166 ; Brandfort, *Verwoerd* (Stell. 224 ; v. d. Byl 2080) ; Wolmaransstad, *Niewoudt* (Stell. 565).

7. BROOMEIA BERKELEY.

Hooker's London Journal of Botany 3 (1844) 193.

Sacc. Syll. Fung. 7 (1888) 94 ; Pole Evans and Bottomley, Trans. Roy. Soc. S. Africa 7, pt. 3 (1919) 189 ; Murray, Journ. Linn. Soc. 20 (1884) 311 ; Fischer, Nat. Pflanz. 7a (1933) 68 ; Lloyd, Myc. Writ. 6 (1920) 917 ; Verwoerd, Ann. Univ. Stell. 3 (1925) 34.

Fruiting bodies in clusters, few to numerous, closely aggregated together on a corky stroma, the upper surface of which is divided into alveolae, in each of which is embedded a single peridium, the walls of an alveola forming shallow upright ridges between the individual peridia. Peridia originally covered by a universal exoperidium, which gradually disintegrates, finally disappearing altogether. Endoperidium thin, membranaceous, sessile, dehiscing by a conical, fimbriate mouth.

The genus *Broomeia* is known only from Southern Africa, where it was first collected by J. Backhouse in 1838 in the Albany district and described by Berkeley in 1944, being named in honour of the botanist, C. E. Broome. Only two authentic species of this genus are known, viz. *B. congregata* Berk., the type species and *B. ellipsospora* v. Höhn. A third species, *B. guadaloupensis* Lév. from Guadeloupe, of which no specimen exists, is said to be almost certainly *Diplocystis Wrightii* Berk. & Curt., which also occurs in Guadeloupe.

Key to the Species.

- | | |
|--|-----------------------------|
| Stroma thick, columnar. Spores globose..... | 1. <i>B. congregata</i> . |
| Stroma thin, horizontal, with edge incurved over the outer row of peridia, forming a margin round the cluster. | |
| Spores elliptical..... | 2. <i>B. ellipsospora</i> . |

1. *Broomeia congregata* Berkeley, [Plate XLVI ; XLVII, fig. 1, 2 ; XLVIII, fig. 2.]

Hooker's London Journ. Bot. 3 (1844) 193.

Murray, Journ. Linn. Soc. 20 (1884) 311 ; Sacc. Syll. Fung. 7 (1888) 93 ; Lloyd, Myc. Writ. 1, Myc. Notes 18 (1904) 193 ; Pole Evans & Bottomley, Trans. Roy. Soc. S. Africa 7, Pt. 3 (1919) 191 ; Verwoerd, Ann. Univ. Stell. 3 (1925) 34 ; Fischer, Nat. Pflanz. 7a (1933) 68.

Fruiting bodies in irregular clusters, 3-17 cm. diam., 1.5-10 cm. thick, consisting of 8 to over 900 peridia closely aggregated together on the surface of a massive, white, more or less columnar, wedge-shaped or irregular corky stroma. Surface of stroma divided into roundish or usually more or less pentagonal alveolae up to 15 mm. diam., in which the

peridia are embedded one sixth to a quarter of their height, the raised walls of the alveolae, 1.3 mm. high forming common dividing ridges between the individual peridia. The whole cluster of peridia is originally covered by a thin, white, membranaceous *exoperidium*, which appears to arise from the stroma at the base of the outer row of peridia and often to follow the outline of the individual peridia, extending between them as a floccose substance. Disintegration of the *exoperidium* takes place from the centre of the cluster towards the periphery, exposing first the mouths, then the remainder of the peridia. Mature plants are completely devoid of the *exoperidium*. *Stroma* solid, corky, more or less flattened or dome shaped at the apex, white except towards the base of the peridia, where it is tinged with mauvy pink. The core of the stroma sometimes breaks away, leaving an irregular hollow base. *Endoperidium* in young stage mauvy pink (Russet Vinaceous then Vinaceous Russet) finally dark brown (Cinnamon Brown, Mars Brown) sometimes whitish, due to the remains of the *exoperidium*; subglobose, ovate, turbinate, or, when tightly packed, angular, obovate, usually longer than wide, but occasionally wider than long; size varying from 15×12 mm. to 6×3 mm. or 7×9 mm., sessile, embedded in base of alveolae; dehiscing by a round or elliptical, dark, fimbriate mouth which is seated on a slightly depressed area. *Gleba* brown to umber (Verona Brown, Warm Sepia) usually completely filling the *endoperidium*. *Columella* lacking. *Capillitium* almost hyaline to dark brown, varying in thickness up to more than diameter of spores, sparsely if at all septate, sparingly branched, almost smooth and regular or wavy, irregularly angled and thickened or nodulose. Spores finely to strongly echinulate, globose to rounded elliptic, $6.8-8.5 \times 5.1-6.8 \mu$. Common size 6-7 μ .

Habitat: often either on, or in close proximity to the base of living *Acacia* trees. Such trees often show gumming, but the association is not clear. Also found under other trees and occasionally on cattle manure. The fungus can often be detected by its characteristic smell, said to resemble aniseed.

Distribution: South Africa.

Specimens examined: on trunk of *Acacia karroo*, Groenkloof, Pretoria, Dec. 1914, I. B. Pole Evans, 8760; under *Acacia Karroo*, Pretoria, Dec. 1914, Bischoff, 8758, A. J. T. Janse, 13023, Feb. 1935, B. Louwrens, 28256, Feb. 1936, A. M. Bottomley, 28655; Mquanduli Distr., Transkei, 1900, A. Pegler 643, 11801; under trees, Kimberley, July 1921, C. Mowbray, 14863; Meintjes Kop, Pretoria, July 1925, L. Goldblatt, 20441; in wattle plantation, Maritzburg, T. R. Sim, April 1919, 11855; in poplar bush, Potchefstroom, Tvl., Aug. 1933, A. P. Goossens, 27807; on cattle manure, Kroonstad, May 1929, J. W. Pont, 25341; habitat unknown, Mangwendi, S. Rhodesia, Mrs. Flemming (Eyles 2763) 14254; Glen, O.F.S., July 1935, J. Sellschop, 28272; Rietvlei, nr. Pretoria, May 1939, J. P. H. Acocks, 30754; Empangeni, Natal, April 1922, H. H. Curson, 17275; on soil, Rust der Winter, Warmbaths, 1936, I. B. Pole Evans, 28722.

Specimens not seen: Boschberg, C.P., 1876, MacOwan (S.A.M. 35073); Albany Distr., Backhouse, 1838, Type; S.W. Africa, Dinter; Umtata, A. Pegler (E. L. Stephens 454 ex. Dr. Kolbe's Herb.); under *Acacia* trees, banks of Klein Vis Rivier, nr. Somerset East, MacOwan, Kew; habitat not known, Inanda, Natal, Medley Wood 426, ex. herb. M. C. Cooke, Kew; Durban, Medley Wood; Port Elizabeth, ex herb. Hooker, Kew; Damaraland, Capt. Een, 1879, Brit. Mus. and Herb. Kew; without locality, E. L. Stephens 174, 454.

2. *Broomeia ellipsospora* v. Höhnelt, [Plate XLVII, fig. 3, 4;

Oesterr. bot. Zeitschr. (1905) 99.

Lloyd, Myc. Writ. 6 (1920) 918, (1921) 1048; Sacc. Syll. Fung. 21 (1915) 479

Verwoerd, Ann. Univ. Stell. 3 (1925) 34.

Diplocystis Junodii Pole Evans & Bottomley, Trans. Roy. Soc. S. Africa 7 (1919) 189.

Fruiting bodies in more or less round or irregular clusters, 2-7 cm. long by 1-5 cm. wide by 2-3 cm. thick, sub-hygroscopic, swelling considerably when wet, no rooting structure seen, the whole under surface resting on top of the soil when found; consisting of few to many peridia (4-80 counted) closely aggregated together on a thin, cinnamon brown, sub-woody to punky, saucer-shaped stroma, the edge of which is erect, acute, toothed and incurved over the outer row of peridia, forming a permanent margin around the cluster. Upper surface of stroma divided into sub-globose or pentagonal walled alveolae, each containing a single peridium. Peridia separated from each other by the common alveolar walls, which are up to 5 mm. high, often dentate and on a level with the edge of the stroma. Under surface of stroma with rounded protruberances caused by the sunken bases of the alveolae in the upper surface, originally invested with a thin, pale smoke grey or brown cortical layer, which breaks away near the base of the turned-up edge, exposing the cinnamon brown (Mikado Brown) obscurely floccose, corky, inner layer. In some cases two layers appear to be present. *Exoperidium*: no young plant seen, but the appearance of several mature specimens in which fragments of tissue remain, indicate that this is white, membranous, and, in the young plant, covers the entire cluster of peridia, finally disappearing completely. *Endoperidium* slightly but firmly embedded in the base of the alveola, sub-globose or oval, sessile, slightly scabrous or finely floccose, grey or brown, with a conical, sharp-pointed, fimbriate, usually darker-coloured peristome, which is either continuous with the rest of the peridium, or seated on a slightly depressed, lighter coloured ring. *Capillitium* threads abundant, thin to size of longer diameter of the spore, fairly uniform, wavy, smooth to nodulose, occasionally branched, not or seldom septate, hyaline to pale brown. *Spores* pale brown with dark epispore, elliptical, occasionally sub-globose or boat-shaped, smooth; punctate and rough, $6.8-5 \times 3.5-5 \mu$.

Habitat: on sand or sandy soil.

Distribution: South Africa.

Specimens examined: Lourenço Marques, Moçambique, *H. Junod*, 11012, *Borle*, Aug. 1920, 14109; Rikatti, Moçambique, 1917, *H. Junod*, 23194, May 1919, *H. Junod*, 12169; Silikats Nek, Magaliesberg, May 1933, *H. Schweickhardt*, 26700; Potgietersrust, April 1940, *E. de Villiers*, 31287; Middelburg, Tvl., *R. A. Dyer*, 30503; between Dealesville and Hertzogville, O.F.S., Aug. 1944, *V. C. Green*, 34355; ? South-West Africa, *R. Marloth*, 26617; Brandberg Mts., N.E. of Cape Cross, S.W.A., Jan. 1933, *N. J. G. Smith* 401, 27510,, found growing next to *Welwitschia* plants under extreme drought conditions; near Kimberley *J. H. Power* (*E. L. Stephens* 403); 20 miles s.w. of Marienthal, S.W.A., *R. H. M. Smithers* (*E. L. Stephens* 412; S.A.M. 52051).

Specimens not seen: South Africa, without locality, *Holub*, *Type*; Upington, *Miss Wilman* (*E. L. Stephens* 567).

Diplocystis, the genus nearest to *Broomeia* and not known to occur in South Africa, is represented by but one authentic species, viz. *D. Wrightii* Berk. et Curt. (Plate XLVIII, fig. 1). It differs from *Broomeia* mainly in having a separate exoperidium to each individual peridium instead of a universal one to the whole cluster, in the separation of the peridia by individual cup-like exoperidial structures instead of by alveolar ridges common to adjacent peridia, and in having an indefinite aperture instead of a well-defined conical mouth.

At the time *Diplocystis Junodii* was described as a new species of this genus (l.c.) no specimen or illustration of either *D. Wrightii* Berk. & Curt. (Plate XLVIII, fig. 1) or of *Broomeia ellipsospora* v. Höhn. had been seen. Although it was suggested that, judging from the description, our fungus might be the same as the latter, the thin stroma with its persistent turned-up edge differed so considerably from the massive, irregular stroma of *Broomeia congregata* that this character seemed sufficiently important to justify excluding it from *Broomeia* and referring it to *Diplocystis*. The importance of the exoperidial characters was not realised until the late C. G. Lloyd forwarded specimens of *D. Wrightii*,

making possible a comparison of the latter with *B. congregata* and '*D. Junodii*'. Lloyd pointed out, at the time of sending the specimens, that the latter was the same as von Höhnelt's *B. ellipsozona*, and after seeing specimens of *D. Wrightii* and an illustration of *B. ellipsozona*, there was no doubt about the matter.

In the paper cited, *Diplocystis* was separated from *Broomeia* on the stroma characters, but after having examined specimens of *D. Wrightii*, I am of the opinion that the exoperidial characters are of more importance, and have therefore reverted to these as a basis of demarcation between the two genera. *B. congregata* and *B. ellipsozona* are very divergent species, but have more affinity for each other than either has for *D. Wrightii*.

I have followed Fischer (Nat. Pflanz. 7a, 1933 : 68) and Coker and Couch (Gestero. 1928 : 143) in placing the genera *Broomeia* and *Diplocystis* in the Lycoperdaceae. The original structure of the gleba yet remains to be determined, but the presence of tramal remains suggests the original presence of chambers.

Geastreae.

Peridium of four layers, the outer three closely adnate and splitting from the apex downwards in a stellate manner into a number of pointed segments or rays, exposing the globose or subglobose inner peridium, which dehisces by one or more apical pores. As in the case of *Lycoperdon*, the inner peridium encloses the capillitium threads which are attached to its inner wall, or to a small columella, when present, and the globose, usually verrucose spores.

There are only two genera in the Geastreae, *Geastrum* and *Myriostoma*, both of which are represented in Southern Africa. *Myriostoma* differs from *Geastrum* in dehiscing by several mouths instead of one and in having several pedicels and columellas instead of one of each (when present) as in *Geastrum*.

8. GEASTRUM Persoon.

Synopsis Methodica Fungorum (1801) 131.

Plecostoma Desv., Journ. de Bot. 2 (1809) 97.

Diploderma Link, Mag. Ges. Nat. Freunde 7 (1816) 44 pp.

Geaster Micheli ex Fries, Syst. Myc. 3 (1829) 8.

Cycloderma Klotzsch, Linnaea 8 (1832) 203.

Astraeus Morgan, Journ. Cincinnati Soc. Nat. Hist. 12 (1889) 19.

Myceliostroma P. Henn., Hedwigia 43 (1904) 185.

Type Species: *Geastrum coronatum* pers.

Unexpanded plant globose, subglobose or ovate with a short or long point. Exoperidium hygroscopic or not, consisting of three layers—an external or mycelial layer, a middle or fibrous layer and an inner or fleshy layer—at first closely surrounding the inner or endoperidium, but at maturity splitting from the apex downwards, to about the middle, into a number of pointed segments or rays. The rays may become expanded to form a star-shaped structure from which the genus derives its name, or they may become recurved. In one section of plants with recurved rays, the fleshy and fibrous layers separate from the mycelial layer and, remaining attached only at the tips, become arched above it, leaving it behind in the substratum as a membranaceous cuplike structure. Such a condition is known as fornicate. The inner peridium is globose to subglobose, thin, membranaceous, smooth or variously roughened, stalked or sessile and dehisces by a single apical mouth. The latter may be little more than a torn aperture, when it is said to be indefinite, or it

may be fimbriate, fibrillose or furrowed (sulcate) on a definite, usually circular area or peristome, outlined or not by a margin. In some species there is a circular swelling at the base of the endoperidium, just above the pedicel, known as an apophysis. The gleba contained in the endoperidium consists of simple, non-septate, pale to dark brown capillitium threads and globose, obscurely to strongly verrucose, brown spores.

Many species of geasters have been described, but it is believed that not more than about eighteen are found in Southern Africa.

Cunningham, Coker and Couch and others have been followed in classifying the species of *Geastrum* on mouth characters.

Key to the Species.

Mouth with a peristome.

Mouth sulcate ;

Exoperidium not hygroscopic

Pedicel and mouth typically long and slender

Base of endoperidium smooth, striate or plicate ; plants usually large..... 1. *G. pectinatum*.

Base of peridium with a collar-like ring or apophysis..... 2. *G. Bryantii*.

Pedicel and mouth typically short, plants small..... 3. *G. nanum*.

Exoperidium hygroscopic.

Endoperidium pedicellate..... 4. *G. campestre*.

Endoperidium typically sessile..... 5. *G. ambiguum*.

Mouth fibrillose ;

Exoperidium not hygroscopic

Endoperidium pedicellate

Exoperidium typically fornicate

Mouth fibrillose-fimbriate with depressed circular margin 6. *G. quadrifidum*.

Mouth coarsely fibrillose to sulcate without circular depressed margin..... 7. *G. dissimile*.

Exoperidium typically recurved or expanded

Plants usually small..... 8. *G. minimum*.

Plants usually large..... 9. *G. limbatum*.

Endoperidium sessile ;

Exoperidium externally more or less glabrous, rays typically acuminate ; plants and spores typically large..... 10. *G. triplex*.

Exoperidium externally usually felted or strigose-tomentose, rays typically wedge-shaped.

Exoperidium typically fully expanded, tips often reflexed 11. *G. saccatum*.

Exoperidium deeply saccate, tips often sub-erect.

Plants small, often caespitose ; exoperidium light coloured..... 12. *G. mirabile*.

Plants medium, exoperidium dark..... 13. *G. velutinum*.

Exoperidium hygroscopic

Endoperidium pedicellate..... 14. *G. arenarium*.

Endoperidium sessile..... 15. *G. mammosum*.

Mouth without a peristome.

Exoperidium not hygroscopic

Endoperidium pedicellate

Exoperidium fornicate, endoperidium smooth..... 16. *G. fornicatum*.

Exoperidium recurved, endoperidium asperate..... 17. *G. Hieronymi*.

Exoperidium hygroscopic

Spores 6-7 μ ; plants usually small..... 18. *G. floriforme*.

Spores 8-10 μ ; plants usually large and woody..... 19. *G. hygrometricum*.

1. *Geastrum pectinatum* Persoon, [Plate XLIX, fig. 1-4.]

Synopsis Methodica Fungorum (1801) 132.

Lloyd, *Geastreae* in *Myc. Writ.* 1 (1902) 15; Hollós, *Gastero. Ung.* (1904) 55, 152; G. H. Cunn., *Gastero.* (1944) 162.*Geaster plicatus* Berk., *Ann. Nat. Hist.* 3 (1839) 339.*G. tenuipes* Berk. in Hook. *Journ. Bot.* 12 (1848) 576.*G. calyculatus* Fuckel, *Symb. Myc.* (1869) 37.*G. Schmidelii* Massee, *Monogr. Brit. Gastero. in Annals Bot.* 4 (1889) 78, non Vittadini.

Unexpanded plant subglobose, submerged then superficial, ochraceous, covered with adhering debris. *Exoperidium* 2-5.5 cm. diam., split to about the middle into 6-10 subequal, acute rays, which are typically recurved, but may be more or less expanded with incurved tips; *fleshy layer* thin, ochraceous-brown, greyish-brown, chestnut, umber, adnate and continuous or cracking irregularly and peeling off in patches exposing the ochraceous fibrous layer, sometimes leaving the latter quite bare; *mycelial layer* adnate, covered with adhering debris, which is usually persistent. *Base* concave to vaulted. *Endoperidium* 0.7-1.8 cm. diam., pedicellate, subglobose, depressed globose or urn-shaped, greyish brown, pale reddish brown, dove-grey, rusty-black; smooth, striate or slightly to deeply sulcate at the base; furrows at base and mouth often covered at first with ochraceous-brown, woolly tomentum; with or without an apophysis; often farinose; pedicel typically long and slender (up to 5 mm.) often surrounded by a collar—the remains of the mycelial layer, which breaks away on expansion. *Mouth* typically long (up to 1 cm.) beaked, slender, deeply sulcate, concolorous or paler or darker than the remainder of the endoperidium, seated upon a definite, circular, depressed peristome, of which the margin is sometimes raised. *Columella* not seen. *Gleba* umber brown. *Capillitium* threads sometimes branched, tinted to pale brown, thicker and paler than average spore. *Spores* dark brown, globose, strongly verrucose, 3.5-5.1 μ diam.

Habitat: solitary or gregarious, amongst humus.*Distribution*: South Africa; Australia; Ceylon; India; Tasmania; New Zealand.

Specimens examined: Fountains, Pretoria, Jan. 1919, *K. A. Lansdell*, 11807; Feb. 1920, *J. C. Howlett*, 12789, det. Lloyd; April 1921, *C. Punt*, 14513; April 1921, *A. M. Bottomley*, 14515a; Silverton, Pretoria, March 1928, *L. Reinecke*, 23202; Johannesburg, *E. Dyke*, 26587; Xumeni Forest, Donnybrook, Natal, June-July 1935, *E. M. Doidge*, 28905; Jan. 1935, 28904; Stellenbosch, Oct. 1921, *P. v. d. Byl* 479; Bosfontein Kloof, Rustenburg Dist., May 1939, *E. M. Doidge & A. M. Bottomley*, 35120; Garstfontein, Pretoria, April 1911, *E. M. Doidge*, 1337, Kew as *G. tenuipes*; Meintjes Kop, Pretoria, March 1905, *A. M. Bottomley*, 20388; Kirstenbosch, *M. Levyns* (E.L.S. 87); nr. Stikland, C.P., *J. P. H. Acocks*, July 1932 (E.L.S. 141; nr. Rhodes Memorial, June 1934, *J. P. H. Acocks* (E.L.S. 346); Newlands, *Woods* (E.L.S. 425.)

Specimens not seen: Tarkastad, C.P., *N. J. G. Smith* 33b; Stellenbosch, *L. Verwoerd* (v. d. Byl 2032); Queenstown, C.P., *F. Pope* (N. J. G. Sm. G. 97).

This species is recognised by its long, slender pedicel and usually long, beaked, sulcate mouth; the endoperidium is often covered with a whitish, floury substance and its base often shows striations or furrows with or without an apophysis.

I have followed Hollós in considering *G. plicatum*—the form with a plicate endoperidial base—a synonym of *G. pectinatum*, since all gradations of the distinguishing endoperidial basal characters are often found in plants of one collection, and it has been found impossible to refer such a collection as a whole to either species. Most of the South African plants have a striate or sulcate base, the smooth form occurring much less frequently.

2. **Geastrum Bryantii** Berkeley, [Plate XLIX, fig. 5.]

Outlines of British fungi (1860) 300.

Sacc. Syll. Fung. 7 (1888) 75; Verwoerd, Ann. Univ. Stell. 3 (1925) 23; Lloyd, Geastreae in Myc. Writ. 1 (1902) 16; Rea, Basid. (1922) 40.

Geaster orientalis Haszl., Grev. 6 (1877) 108.

G. Kunzei Wint., in Rabenh. Krypt. Fl. 1 (1884) 911.

This species is very closely related to *G. pectinatum*, from which it differs only in the presence of a well-defined collar or ring around the base of the endoperidium just above the pedicel.

Habitat: as for *G. pectinatum*.

Distribution: South Africa; Australia; North America.

Specimens examined: Fountains, Pretoria, Feb. 1927, *A. M. Bottomley*, 21200; without locality (v. d. Byl 1422 ex herb. C. G. Lloyd).

Specimens not seen: Pretoria, *A. Martin* (N. J. G. Sm. G. 91 and Wit. Herb.).

The South African plants so far seen do not show as definite a collar as illustrated for plants of this species in other countries, in fact this character appears to be more in the nature of an exaggerated or sharp-rimmed apophysis. Plants with a normal apophysis occur in the above collection (21200) together with others showing the more typical *G. Bryantii* character.

3. **Geastrum nanum** Persoon, [Plate XLIX, fig. 6: L, fig. 2.]

Memoire, Journal de Botanique 2 (1809) 27.

Hollós, Gastero. Ungar. (1904) 55, 152.

Geaster Schmideli Vitt., Monogr. Lycop. (1842) 157; Coker & Couch, Gastero. (1928) 134.

G. Rabenhorstii Kunze in Rabenh. Fung. eur. (1875).

G. striatus Kalchbr., Adalok Szepesség virányához 2 (1862) 154.

Exoperidium 1.5-3 cm., split to about the middle into 5-9 unequal, acuminate rays, typically recurved, often expanded, with or without recurved tips; *fleshy layer* adnate, smooth or less often cracked, ochraceous-brown to umber-brown; *mycelial layer* persistent, covered with adhering soil and vegetable debris. *Endoperidium* 5-11 mm. across, shortly pedicellate, subglobose, oval or urn-shaped, usually with a slight to pronounced basal apophysis, pale to umber brown or leaden grey, due to a whitish farinose covering; pedicel typically short (1-1.5 mm.) cylindrical or elliptic. *Mouth* sulcate, elevated, shortly and acutely conical, concolorous with, or often darker than the remainder of the peridium, seated on a well-defined, depressed peristome. *Gleba* dark umber brown. *Columella* sometimes present, small, oval. *Capillitium* threads pale to dark, usually thinner, but sometimes thicker, up to 8 μ , than the spores. *Spores* brown with darker episore, verrucose, 4-6.8 μ diam.

Habitat: in open or shaded places, on bare ground or in humus.

Distribution: South Africa; Australia; North America; England; Europe.

Specimens examined: Pretoria, Feb. 1923, *C. Punt*, 17004; Irene, nr. Pretoria, Nov. 1932, *General J. C. Smuts*, 26600; Kromrivier, Rustenburg Distr., Dec. 1938, *E. M. Doidge & A. M. Bottomley*, 35123; Grahamstown, Oct. 1933, *N. J. G. Smith* 55, 27513; Elim Hospital, Louis Trichardt, Tvl., Nov. 1932, *P. Thomas*, 26601; in *Eucalyptus*

plantation, Potchefstroom, July 1935, *J. Sellschop*, 28271; in red sand under *Acacia*, Mauritzfontein, Kimberley, June 1936, *J. P. H. Acocks* 401, 35130; Mossel River nr. Hermanus, Dec. 1938, *Miss Esterhuysen* (*E. L. Stephens* 446) 35024; Fischhoek, July 1937, *D. Peers* (E.L.S. 445).

This species is distinguished from *G. pectinatum* by its small size, shorter and proportionately thicker pedicel, shorter, more conical mouth and more commonly expanded exoperidium. It is so different from *G. pectinatum* in all the South African collections so far seen, that I have followed Hollós (l.c.) in keeping the two species separate.

4. *Geastrum campestre* Morgan, [Plate L, fig. 3.]

American Naturalist 21 (1887) 1026.

Sacc. Syll. Fung. 7 (1888) 471; N. J. G. Smith in Rec. Albany Museum, Grahams-town 4 (1935) 275; Cunningham Gastero. (1944) 165.

Geaster pseudomamosus P. Henn., Hedwigia 39 (1900) 54.

G. asper (Mich.) Lloyd Geastreae in Myc. Writ. 1 (1902) 18; Hollós Gastero. Ung. (1904) 57.

Unexpanded plant up to 1.7 cm. diam., depressed globose, dirty white with adhering vegetable debris, originally submerged. *Exoperidium* hygroscopic, up to 3.5 cm. diam., splitting two-thirds of the way into 7–10 subequal, lanceolate segments, involute when dry, folding under or on the side of the endoperidium, with one or several segments over or under, seldom completely over; expanded when moist, with tips slightly turned up. *Fleshy layer* umber, smooth or cracking off when wet, in the latter case exposing the whitish fibrillose layer; *mycelial layer* thin, with debris attached, finally often peeling off. *Base* strongly umbilicate. *Endoperidium* subglobose, up to 1.5 cm. diam., shortly pedicellate, dirty white, greyish, buff or pale brown, minutely but densely covered with whitish to pale brown granules. *Mouth* seated on a depressed area, sulcate, short or long to almost beaked, paler, concolorous or darker than remainder of endoperidium. *Gleba* usually very dark, blackish brown, sometimes pale brown. *Columella* present, small, white, spherical. *Capillitium* tinted to pale brown, typically less than spore diameter. *Spores* large, globose, dark brown, 4.5–6.8 μ diam., strongly verrucose.

Habitat: on ground and in humus.

Distribution: South Africa; North America; Australia; Europe.

Specimens examined: Mooibank, Potchefstroom Distr., Feb. 1924, *H. O. Lawrence*, 18123, 18124, det. Lloyd as *G. asper*; Irene-Delmas Road, Tvl., *I. B. Pole Evans*, 24921; St. Helena Bay, *R. Smithers*, April 1936 (E.L.S. 1423).

Specimens not seen: South-West Africa, *Dinter*; Carolina, Tvl., *E. Young* (N. J. G. Sm. G. 179 & Herb. Wit.); Queenstown, C.P., *F. Pope* (Albany Museum, N. J. G. Sm. G. 7 and Kew).

This species, more commonly known as *G. asper*, is characterized by its hygroscopic habit, sulcate mouth and asperate and shortly pedicellate endoperidium. The plants are typically involute when dry, but individual specimens may dry in a partly or wholly recurved position.

According to Cunningham, *G. campestre* has spores 6–8 μ diam. and *G. Clelandii* (Lloyd) Cunn. spores 4–5.5 μ . N. J. G. Smith (l.c.) however, found that in South African plants, spores to include both sizes were present in the same collection. The latter opinion is confirmed by an examination of Transvaal material. All South African plants have therefore been referred to *G. campestre*.

5. *Geastrum ambiguum* Montagne.

Florula Boliviensis (1839) 47.

Hollós Gastero. Ung. (1904) 19, 153, Tab. 9, f. 15-17; Sacc. Syll. Fung. 7 (1888) 78.

Geaster Drummondii Berk., London Journ. Bot. 4 (1845) 63; Verwoerd, Ann. Univ. Stell. 3 (1925) 21.

Geaster striatulus Kalchb., in Grev. 9 (1880) 3.

G. Schweinfurthii P. Henn., in Engl. Bot. Jahrb. 14 (1891) 361.

G. involutus Mass., in Grev. 2 (1892) 3.

Geastrum Drummondii Berk., G. H. Cunn., Gastero. (1944) 167.

Unexpanded plant small, globose, submerged then superficial. *Exoperidium* hygroscopic, 1.2-3.5 cm. diam., split to about the middle, or two-thirds of the way into 5-11 lanceolate, acute, more or less equal rays, which are fully expanded when wet and strongly involute over or under the endoperidium when dry; *fleshy layer* adnate, umber, smooth or transversely rimose; *Mycellial layer* dirty white, at first covered with debris, becoming more or less smooth, slightly umbilicate. *Endoperidium* sessile or very shortly pedicellate, subglobose, 0.8-1.6 cm. diam., brownish grey, dirty white, smoke grey or drab, densely or obscurely granular to almost smooth. *Mouth* definite, sulcate, conical, concolorous or slightly darker than remainder of peridium. *Gleba* dark brown. *Capillitium* threads attenuated, usually thinner than spore diameter, almost hyaline to pale brown. *Spores* globose or less often subglobose, distinctly but rather sparsely verrucose, pale brown with dark epispore, 4.5-6.8 μ diam.

Habitat: in sand or in open or shaded ground.

Distribution: South Africa; Australia; Tasmania.

Specimens examined: in open field, Dundee, Natal, Dec. 1909, *E. M. Doidge*, 956, det. Lloyd as *G. striatulus*; under *Acacia Karroo*, Bedford, C.P., Nov. 1915, *J. Gane*, 9199, det. Lloyd as *G. striatulus*; on termite mound, Butterworth, C.P., Nov. 1915, *P. N. Doran* (Pegler 2367) 9200, as *G. striatulus*; nr. Graafwater, C.P., *I. B. Pole Evans*, 33182; Garstfontein, Pretoria, April 1911, *P. J. Pienaar*, 1353; St. Helena Bay, April 1936, *R. Smithers* (*E. L. Stephens* 423) 35122; Sibangwana, N. Zululand, Nov. 1938, *H. W. Martley*, 35021; Stellenbosch, April, *A. V. Duthie*, 35032; ? bank of Anghrabies River, *Barnard* (S.A.M. 45945 as *G. saccatum*).

Specimens not seen: on sandy patches under trees, nr. Grahamstown, Queenstown, C.P., Tarkastad, and Alice, *N. J. G. Smith* *G. 90*, *G. 171* (Albany Museum, Kew as *G. Drummondii*); Port Elizabeth, *E. Archibald*; Stellenbosch, *G. Nel* (Stell. 1105, 1139 as *G. Drummondii*); Brandfort, *L. Verwoerd* (Stell. 2083 as *G. Drummondii*); Olukonda in Amboland, S.W.A., *Schinz*; without locality, *P. Hennings* as *G. Drummondii*.

This species, better known as *G. Drummondii*, is recognised by its hygroscopic nature, its sessile endoperidium and sulcate mouth.

6. *Geastrum quadrifidum* Persoon, [Plate L, fig. 1.]

Synopsis Methodica Fungorum (1801) 133.

Geaster coronatus (Schaeff.) Schroet. Pilze in Krypt. Fl. Schlesiens 3 (1889) p.p., non *G. coronatus* Persoon (1801); Lloyd, Geastreae in Myc. Writ. 1 (1902) 31; Hollós, Gastero. Ung. (1904) 61.

Exoperidium typically fornicate, up to 3.5 cm. high (excluding cup) and 3 cm. wide, splitting about two-thirds of the way into 4-5, occasionally 6 segments, the margins of which curl under, giving the segments a long narrow appearance. On expansion, the

mycelial layer remains behind in the substratum as a hollow, membranous, cup-shaped structure, while the fleshy and fibrous layers separate from it, become strongly arched in the centre, finally standing erect with the tips of the rays still attached to the corresponding tips of the mycelial cup; *fleshy layer* brown, smooth, finally usually cracking and peeling off either in patches or altogether, exposing the tough, ochraceous, membranous fibrous layer. *Endoperidium* pedicellate, 0.7–1.9 cm. wide, depressed-globose or urceolate, usually with a circular, constricted apophysis at the base just above the pedicel; covered with minute white particles, finally usually smooth, pale grey to brownish grey, becoming bay-brown in weathered specimens. *Pedicel* up to 2.5 mm. long, broadly elliptic. *Mouth* fibrillose-fimbriate, very occasionally inclined sulcate, concolorous or paler or darker than remainder of endoperidium, usually conical, sometimes almost plane, seated on an often paler, well-defined area outlined by a definite, depressed margin. *Gleba* umber. *Capillitium* threads tinted to brown, up to 6.8 μ diam. *Spores* globose, almost hyaline, pale brown, minutely and sparsely verrucose, 2.5–3.4 μ diam.

Habitat: in humus under trees and bushes.

Distribution: South Africa; Australia; North and South America; Europe; India; New Zealand.

Specimens examined: Stella Bush, Durban, July 1914, *Indian Collector* (v. d. Byl 689) 31895; Umgeni, Natal, Sept. 1917, *G. Hobbs* (v. d. Byl 754) 31942; Durban, v. d. Byl 524, 35131 as *G. fornicatus*; Aug. 1917, *Leslie* (N.H. 744) 32486.

This species, probably better known as *G. coronatum*, is recognised by its fornicate habit and fibrillose-fimbriate mouth, which is outlined by a definite, depressed margin. Except for the mouth characters and smaller spores, this plant is very like the South African form of *G. fornicatum*. It is rather longer and narrower in proportion than the typical form and the rays look narrower on account of the margins being curled under. The spores are smaller than mentioned by Hollós and Cunningham, but agree with those seen by Verwoerd (l.c.).

According to Smith (l.c.) who submitted specimens to Cunningham, the latter considers this plant to be a form of *G. fornicatum* (*G. fenestriatum*) but judging from various descriptions and illustrations, it appears more closely to resemble the plant called *G. coronatus* by Hollos, Lloyd, Coker and Cough and Verwoerd.

7. *Geastrum dissimile* n. sp., [Plate LI, fig. 1-2.]

Peridio juvene depresso-globo, 2–5 cm. diam., mycelio albo intermixto quisquiliis humi tecto. *Exoperidio* typice fornicato, ad ultra medium in plerumque 4, rarius 5 segmenta partito; segmentis acuminatis cuneatisque, marginibus aliquando revolutis; interno griseo ('Light Drab'), castaneo, umbrino, persistente vel secedente; medio griseo vel pallido-fusco; externo rigidulo, crassiusculo, mycelio albo intermixto, quisquiliis humi tecto, calyciformi ad terram manente. *Endoperidio* depresso-globo vel urceolato, stipitato, plerumque versus basin constricto, griseo, brunneo-griseo, umbrino-atro, tenuiter granulato; pedicello albo, elliptico, usque 3 mm. longo; peristomio determinato, saepe subtiliter elevato, concolori aut discolori, crasse fibrilloso, fere sulcato, non distincte depresso marginato cincto. *Gleba* umbrina. *Columella* parva, obtusa. *Hyphis capillitii* longis, brunneis levibus, ad 8.5 μ cr. *Sporis* globosis, brunneis, subtiliter et parce verrucosis, 3.4–4.1 μ diam.

Geastrum quadrifidum affinis sed differt praecique ostiolo qui fere sulcato et non depresso marginato cinctus est.

Hab. in humo, Fountains, Pretoria, leg. A. M. Bottomley, 14515 b.

Unexpanded plant depressed-globose, 2.5 cm. diam., covered with white mycelial threads mixed with humus debris. *Exoperidium* typically fornicate, splitting two-thirds of the way into 4, occasionally 5, acuminate or wedge-shaped segments, the margins of which often curl under; fleshy layer grey (Light Drab), chestnut brown (Verona Brown), umber, persistent or peeling off from the tips and margins upwards; fibrous layer grey or pale brown; mycelial layer thick, covered with debris, forming at the base of the plant a well-developed cup which may become completely detached in old specimens. *Endoperidium* pedicellate, depressed-globose or urceolate, usually with a well-defined, circular, basal apophysis just above the pedicel, dove grey, brownish grey, umber or brownish black, finely granular or rugulose; pedicel white, elliptical, up to 3 mm. long; mouth definite, often slightly raised, concolorous or lighter or darker than the remainder of the endoperidium, coarsely fibrillose to almost sulcate, not surrounded by a definite margin. *Gleba* umber. *Columella* small, obtuse. *Capillitium* threads long, brown, simple, smooth, up to 8.5 μ thick. *Spores* globose, brown, finely and sparsely verrucose, 3.4-5.1 μ diam.

Habitat: in humus under trees and shrubs.

Distribution: South Africa.

Specimens examined: Fountains, Pretoria, Feb. 1920, J. C. Howlett, 12790; March 1936, K. Lansdell & A. M. Bottomley, 28457; April 1921, A. M. Bottomley, 14515 b, type; Johannesburg, May 1945, A. M. Bottomley, 35132; Fairy Glen, Pretoria, Jan. 1928, L. Reinecke, 23165.

This species closely resembles *G. quadrifidum*, but differs in the coarse, fibrillose to sulcate mouth and in the absence of a depressed margin around the mouth area. In general structure and appearance it also resembles *G. fornicatum*, but the latter has an indefinite mouth. It was originally thought that this plant might be *G. MacOwani*, since the latter has the same type of mouth as depicted by Lloyd (Myc. Writ. 2, 1907: pl. 96) for Prof. Plóttner's South African specimens, but Mr. Talbot, South African mycologist working at Kew, kindly compared one of our specimens with that in Kew Herbarium named by Lloyd *G. fornicatus* Huds. form *MacOwani* Kalchbr. and informs me that our plant is smaller, lighter in colour and of a different texture.

8. *Geastrum minimum* Schweinitz, [Plate LII.]

Schrift. der Naturforschenden Gesellschaft zu Leipzig 1 (1822) 32, non Chevallier Sacc. Syll. Fung. 7 (1888) 80; Hollós, Gastero. Ung. (1904) 159; Lloyd, Geastreac in Myc. Writ. 1 (1902) 27, 28; Verwoerd, Ann. Univ. Stell. 3 (1925) 22.

Geaster marginatus Vitt., Monogr. Lycoperd. (1842) 19.

G. Cesatii Rabenh., Bot. Zeit. 9 (1851) 628.

G. granulatus Fuck., Enumerat. 15 (1860) 41.

G. calceus Lloyd, Myc. Writ. 2, Myc. Notes 25 (1907) 311.

Exoperidium 0.9-3 cm. wide, splitting to about half way into 7-9 unequal acuminate rays, typically recurved, but often more or less expanded with slightly incurved tips, not fornicate; *fleshy layer* ochraceous, brownish-grey, umber, often paler round the edges, adnate, becoming cracked but not peeling off to any extent; *mycelial layer* covered with adhering debris, not separating from the fleshy and fibrous layers to form a basal cup. *Base* concave to vaulted. *Endoperidium* shortly pedicellate, 4-9 mm. diam., subglobose or more or less oval, grey or buff in colour, finely furfuraceous, with or without an apophysis, non-weathered plants covered with whitish granules. *Mouth* fimbriate, conical, seated on a relatively large, circular area surrounded by a well-defined groove. *Gleba* umber brown. *Capillitium* threads usually paler and thinner than the spores. *Spores* 3.4-5 μ globose, distinctly but rather sparsely verrucose, brown with darker epispore.

Habitat : Amongst vegetable debris under bushes and trees and in open ground.

Distribution : South Africa ; North and South America ; Australia ; Europe ; Japan ; India ; New Zealand.

Specimens examined : under pine trees, Grahamstown, March 1931, *N. J. G. Smith*, *G.* 34, 25899, Kew, Albany Museum ; Johannesburg, Jan. 1925, *C. N. Knox Davies*, 20394 ; Magaliesberg, Nov. 1917, *V. A. Putterill*, 11006, det. Lloyd ; under *Acacia caffra*, Fountains, Pretoria, Dec. 1914, *I. B. Pole Evans*, 8781 ; open ground amongst rocks, Premier Mine nr. Pretoria, Nov. 1913, *I. B. Pole Evans*, 7100 ; Boschberg Mt., Somerset East, 1875, *MacOwan* 1174 (S.A.M. 35068) 35304, as '*G. granulatus*' ; Stellenbosch, *A. V. Duthie* (E.L.S. 53).

Specimens not seen : without locality, *Prof. Plottner* (Lloyd Myc. Coll. 57280 as *G. calceus*, Plate LXI, fig. 2). Lloyd describes this as "a large *G. minimus* with the endoperidium densely covered with coarse, white, granular particles" ; without locality, Herb. Berlin as *G. granulatus* ; Kentani, Oct. 1906, *A. Pegler* 1370, Kew ; Cape Province, 1891, *P. MacOwan*, Kew.

This species is recognised by its small size, recurved or expanded, but not fornicate exoperidium, short pedicel, well-defined peristome surrounded by a definite groove and the presence of whitish granules (described by Hollós as glistening crystals) on the peridium of young plants. It resembles *G. quadridum* in peristome characters and the surface of the endoperidium, but differs from it in its usually smaller size, absence of mycelial cup, larger and darker spores and usually thinner capillitium.

Coker and Cunningham consider that the fornicate character is only a stage of the *minimum* form and exclude the latter as a separate species ; but in no South African collection have the two forms so far been found together, nor do transitional forms occur in either species. The plants are so markedly different in habit and appearance that it is proposed to follow other mycologists in this country and retain *minimum* as a separate species.

9. *Geastrum limbatum* Fries. [Plate LIII.]

Systema mycologicum 3 (1829) 15.

Hollós, *Gastero. Ung.* (1904) 75 ; *N. J. G. Smith*, *Rec. Albany Mus.* 4 (1935) 269 ; *G. H. Cunningham*, *Gastero.* (1944) 169 ; Lloyd, *Geastreae in Myc. Writ.* 1 (1902) 23.

Geaster limbatum var. *ellipsostoma* Smith l.c.

Exoperidium 3.5-8.5 cm. diam., split to the middle or beyond into 7-10 unequal, acute or long acuminate rays, which become typically recurved or may be expanded with incurved or revolute tips ; *fleshy layer* bay brown, umber brown, greyish brown or occasionally silver grey (Drab, Hair Brown, Warm Sepia) continuous or cracked in all directions, adnate or peeling off either partially or entirely in weathered specimens ; *fibrous layer* pale tan or dirty white ; *mycelial layer* at first with large amount of adhering debris, which may later disappear entirely or only from the basal portion, or it may persist, depending on whether the rays become involute or revolute. *Base* plane or concave, often vaulted. *Endoperidium* pedicellate, 1.2-3 cm. diam., sub-globose, depressed globose, urn-shaped or sub-pyriform, with or without a basal apophysis, grey, parchment coloured, ochraceous, pale greyish-brown, dark umber (Mouse Grey, Drab, Wood Brown) slightly to densely farinose, obscurely pitted, or almost smooth when old. *Pedicel* whitish, greyish, umber, often paler than the peridium, elliptical, 3-4 mm. thick, 2-4 mm. long, sometimes with a depressed ring around the base. *Mouth* fimbriate, often depressed, plane or short to long conical, surrounded by a paler, darker or concolorous, round to elliptical, fibrillose to almost

sulcate, silky zone. *Gleba* umber to blackish brown. *Columella* usually present, small to very large. *Capillitium* threads paler than spores, up to 7 μ diam. *Spores* brown with darker epispore, globose slightly to strongly verrucose, sometimes almost papillate, 3.7–6.8 μ including the warts.

Habitat : amongst leaves under trees, gregarious.

Distribution : East and South Africa ; North America ; Australia ; Britain ; Europe ; New Zealand.

Specimens examined : Meintjes Kop, Pretoria, March 1921, *A. M. Bottomley*, 14501, det. Lloyd ; April 1925, 20434 ; under Acacias, Fountains, Pretoria, March 1925, *A. M. Bottomley*, 20390 ; March 1936, *A. M. Bottomley*, 28652 ; Town Bush, Pietermaritzburg, Nov. 1934, *W. G. Rump* 313, 28675 ; Hopevale, Donnybrook, Natal, *K. E. Morgan*, 28623, Feb. 1935, 35023, Oct. 1934, 35026, *E. M. Doidge*, Jan. 1935, 28812, 28813 ; under *Podocarpus*, Hogsback, Alice, C.P., about 1932, *A. Lyle* (N. J. G. Sm. G. 351 as *G. limbatus* var. *ellipsostoma* N. J. G. Smith) 27809 ; Haenertsburg, N. Tvl., *E. M. Doidge*, July 1934, 27803 ; Garstfontein, Pretoria, March 1944, *A. M. Bottomley*, 35133, *E. M. Doidge*, 35018 ; Xumeni Forest, Donnybrook, Dec. 1943, *E. M. Doidge*, 35167 ; Brenton, Knysna, *G. R. Duthie*, 35028.

Specimens not seen : Somerset East, *MacOwan* 1236 ; Palm Kloof, Victoria Falls, S. Rhodesia, Cheesman.

This species is distinguished by its often dark colour, the definite, fimbriate mouth, the pedicellate endoperidium and the dark, verrucose spores. The exoperidium is typically reflexed, as in fornicate types, but the rays of old weathered specimens are often involute, in which case the mycelial layer breaks away from the arched base and peels off with the adherent debris up to the tips of the rays, where remains are often seen. Involute specimens sometimes resemble *G. triplex*.

Smith's variety *ellipsostoma* is considered to be only an extreme form of the species, since an examination of seventy-four plants, representing one collection from the same spot on the same day, showed a gradation of mouth shapes, on which the variety is founded, from spherical to broadly oval and narrowly elliptical. Further, the spores of Smith's specimen, N. J. G. Sm. G. 35, deposited in the National Herbarium, are no more verrucose, in fact are less so, than those of several other collections examined ; the spore size falls within the range of that of the normal type. Our specimen No. 27803 from Haenertsburg, shows the same elliptical mouth, but larger, more verrucose spores and the endoperidium more thickly farinose.

10. *Geastrum triplex* Junghuhn, [Plate LIV ; LV.]

Tijdschrif voor Natuurlich Gesch. en physiologie 7 (1840) 285.

Hollós, *Gastero. Ung.* (1904) 73 ; N. J. G. Smith, *Rec. Albany Mus.* 4 (1935) 270 ; G. H. Cunn., *Gastero.* (1944) 172.

Geaster lageniformis Vitt., *Monogr. Lycoperd.* (1842) 16.

G. Archeri Berk., *Fl. Tasm.*, 2 (1860) 264.

G. Michelianus W. G. Sm., *Gard. Chron.* (1873) 608.

G. vittatus Kalchbr. & Cooke, *Grev.* 9 (1880) 3.

G. capensis Thümen in *Mycoth. univ.* 815 ; *Sacc. Syll. Fung.* 7 (1888) 85 ; Verwoerd, *S. Afric. Journ. Sci.* 23 (1926) 292.

G. Morgani Lloyd in *Myc. Writ.* 1, *Myc. Notes* 8 (1901) 80.

G. squamosus Lloyd in Myc. Writ. 2, Myc. Notes 26 (1907) 339.

Geastrum Archeri (Berk.) Boedijn, Bull. Jard. Bot. Buitenzorg, 16 (1940) 412.

Unexpanded plant depressed globose with a prominent, straight or oblique point, dirty white to pale ochraceous, glabrous, sometimes shining, attached to a mass of copiously branched, white mycelial threads. *Exoperidium* up to 8 cm. wide when expanded, splitting to about half way or more into 5-8 rays, which in typical plants are long acuminate; *fleshy layer* ochraceous, cinnamon, reddish brown or umber, usually becoming cracked, and in wet weather often cracking and peeling off from the tip to the base of the rays, leaving the remainder behind as a cup-shaped structure around the base of the endoperidium; *mycelial layer* thin, glabrous, often shining, usually pale greyish-ochraceous and free from debris, often splitting longitudinally along the rays, or radially from the base, into striae. *Base* usually concave, umbilicate. *Endoperidium* up to 2.5 cm. diam., sessile, depressed or subglobose, concolorous with, or lighter or darker than the inner surface of the exoperidium, membranous, glabrous. *Mouth* almost plane or typically short to long conical, fibrillose, usually but not always surrounded by a well-defined, broad peristome, which is sometimes limited by a raised margin, concolorous with, or paler or darker than the rest of the endoperidium. *Gleba* usually umber in mature specimens. *Capillitium* threads variable, usually paler than the spores and up to thicker than the spore diameter. *Columella* either large and clavate or indistinct. *Spores* 4-5.5 μ diam., average size about 4.5 μ , usually dark and strongly verrucose when mature.

Habitat : usually amongst vegetable debris under trees or shrubs.

Distribution : South Africa; North and South America; Australia; Britain, Europe; Tasmania; New Zealand.

Specimens examined : Pretoria, March, 1921, 14502; Feb. 1912, *J. C. Howlett & C. Coetzee*, 2136; Fountains, Pretoria, April 1921, *A. M. Bottomley*, 14642; Jan. 1919, *K. Lansdell*, 11808; *J. C. Howlett*, Feb. 1920, 12791; *L. C. Turner*, Jan. 1915, 8811; March 1936, *A. M. Bottomley & B. Lonwres* 28458; Silverton, Pretoria, March 1928, *L. Reinecke*, 23196 a; Garstfontein, Pretoria, April 1911, *P. J. Pienaar*, 1352, 1353, 1354, 1356, Kew; Apies River, Pretoria, March 1942, *E. J. Scott*, 33755; Meintjes Kop, Pretoria, April 1925, *A. M. Bottomley*, 20422; near Umtata Falls, C.P., Feb. 1929, *McLoughlin*, 30508; Brenton, Knysna, *Duthie* 322, 31486; Papegaaiberg, Stellenbosch, June 1921, *Duthie* 307, 31475; April 1929, 35031; Stellenbosch, *A. V. Duthie* (E.L.S. 52); Kirstenbosch, Newlands, C.P., *A. M. Bottomley*, 24840; Hopevale, Donnybrook, Natal, Dec. 1940, *E. M. Doidge*, 35119; Jan. 1935, 35118; March 1933, *K. E. Morgan*, 32200; Feb. 1935, 35017; Qudeni, Nkandhla Distr., Zululand, March 1939, *J. Gerstner* 3255, 30758; Cape Peninsula, *E. L. Stephens* 140; Kirstenbosch, C.P., July 1934, *A. M. Acocks* (E. L. Stephens 371) 27676; Kentani, C.P., Feb. 1915, *A. Pegler* 1978, 9546; Haenertsburg, Tvl., March 1938, *S. Thompson* (T. R. L. 280) 29938; O.F.S., Jan. 1937, *Miss Olivier* (E. L. Stephens 444) 35020; locality unknown, Feb. 1916, *J. M. Sim*, 9440; Potchefstroom, Tvl., March 1939, *M. Gunn*, 30512; locality unknown, *R. Marloth*, 26610; Boschberg Mts., Somerset East, *MacOwan* 1236, Type of *G. capensis* (S.A.M. 35057) 35303, Kew; ? Boschberg Mts., *Tuck* (MacOwan 1124 as *G. fimbriatus* (S.A.M. 35059) 21941; Inanda, Natal, *J. Medley Wood* 489 as *G. fimbriatus*, 11154, 10414.

Specimen not seen : Woodbush (Wit. Herb. 232).

Typical plants of this species are distinguished by the following characters—large size, long acuminate rays, broad conical mouth, usually glabrous, longitudinally striate underside of the exoperidium and large, dark, strongly verrucose spores. Variations of these characters are, however, frequent and specimens are often very difficult to distinguish from *G. saccatum*. *G. lageniformis* is *G. triplex* with unusually narrow acuminate rays and a fimbriate mouth clearly defined by a broad, silky surrounding zone.

G. capensis Thüm. is indistinguishable from *G. triplex*. MacOwan's type specimen, *MacOwan 1236*, is 9 cm. diam. and is split two-thirds of the way into six broad, tapering segments, from which the fleshy layer splits in a characteristic manner. The inner peridium is globose, with a definite, fimbriate mouth surrounded by a paler zone.

South African specimens of *G. fimbriatum* appear to be a mixture of *G. triplex* and *G. saccatum*; J. Medley Wood's specimens, *Medley Wood 489*, have the typical spores of *G. triplex* but the felted mycelial layer of *G. saccatum* as interpreted by Hollós; MacOwan's No. 1124 have the spores of *G. saccatum* but the glabrous mycelial layer of *G. triplex*. In no case is the mycelial layer coated with debris. In all these specimens the mouth is fimbriate and seated on a definite but not limited peristome. European specimens distributed by Rathay, Hollós and Rabenhorst have an indefinite mouth without a peristome. Of two specimens distributed by Sydow, however, in his *Mycotheca Germanica*, one has an indefinite non-peristomatic mouth and a glabrous mycelial layer, while the second has a finely fimbriated peristomatic mouth and a felted mycelial layer. Both specimens are free from debris, which Cunningham considers *G. fimbriatum* should have. There would therefore still appear to be considerable difference of opinion with regard to this species, but since the general opinion seems to be that *G. fimbriatum* should at any rate, have an indefinite mouth, the South African specimens have been referred to *G. triplex*, which they most nearly resemble.

A specimen (in Roy. Bot. Mus. Berlin) collected by Dr. H. Schinz in South-West Africa (*Hedwigia* 28, 1889: 7) and identified by Dr. Ed. Fischer as "near *G. fimbriatus*" except for the larger size of the spores, may possibly likewise be *G. triplex*, since he describes the mouth as fimbriate and separated from the rest of the endoperidium by a circular groove; the size of the spores is given as 4-5 μ diam.

11. *Geastrum saccatum* Fries, [Plate LVI.]

Systema Mycologicum 3 (1829) 16.

Ed. Fischer, *Nat. Pflanzenfam.* 7a (1933) 73; G. H. Cunningham *Gastero* (1944) 172; Lloyd, *Geastreae* in *Myc. Writ.* 1 (1902) 37; Hollós, *Gastero. Ung.* (1904) 71, 157; Verwoerd, *Ann. Univ. Stell.* 3 (1925) 21.

Geaster Lloydii Bres. et Pat., in Lloyd *Myc. Writ.* 1, Notes No. 6 (1901) 50.

G. velutinus Morgan, *Journ. Cincinnati Soc. Nat. Hist.* 18 (1895) 38.

G. velutinus var. *caespitosus* Lloyd, *Geastreae* in *Myc. Writ.* 1 (1902) 36.

Unexpanded plant up to 2 cm. diam., globose or subglobose without the point, mucronate or abruptly fairly long pointed, buff to reddish brown, typically tomentose to strigose-felted, sometimes smooth, epigeal, attached to a mass of white mycelial threads. *Exoperidium* 0.7-6 cm. wide, but usually small to medium, saccate, occasionally drying recurved, splitting to about half way into 5-10 acute segments, the tips of which are usually recurved, but may remain upright or expanded; *fleshy layer* thick and fleshy at first, finally thin, smooth or cracking and peeling off irregularly, cream to delicate lilaceous pink, drying to a light brown, greyish brown, bay brown or umber; *mycelial layer* ochraceous, pale brown or reddish brown, usually more or less felted, tomentose-felted or sometimes strigose-felted adnate or peeling off in patches, sometimes with debris adhering. *Base* concave, flat or convex, usually with an umbilical scar. *Endoperidium* up to 1.5 cm. diam., subglobose, sessile, finely tomentose at first, finally more or less glabrous, concolorous with, or paler or darker than, the exoperidium, usually partly enclosed by the saccate base of the latter. *Mouth* fibrillose, plane, shortly and broadly conical or occasionally long conical. *Gleba* umber. *Capillitium* threads tinted to pale brown, sometimes rough, average width equalling the spore diameter, sometimes larger. *Columella* indistinct. *Spores* globose, moderately to fairly strongly verrucose, brown with darker epispore, 3.5-4.5 μ , usual size about 4 μ diam.

Habitat : solitary or gregarious, sometimes in hard exposed ground, usually in humus in shaded positions.

Distribution : Africa ; North and South America ; Australia ; Britain ; Europe ; West Indies ; Tasmania.

Specimens examined : Pretoria, May 1925, *A. M. Bottomley & C. Punt*, 20584 ; March 1925, *A. M. Bottomley*, 20393 ; March 1924, 18182 ; March 1921, *E. M. Doidge*, 14482 ; Feb. 1923, *C. Punt*, 17003 ; April 1913, *I. B. Pole Evans*, 6684 ; July 1913, *I. B. Pole Evans*, 7099 ; Feb. 1915, 8810 ; Fountains, Pretoria, Dec. 1914, *I. B. Pole Evans*, 8765 ; Jan. 1928, *L. Reinecke*, 23146 ; April 1921, *A. M. Bottomley*, 14642 ; March 1924, 18139 ; April 1921, 14495 ; Feb. 1921, 14480 ; *L. C. Turner*, Nov. 1915, 8811 ; Fairy Glen, Pretoria, Jan. 1928, *L. Reinecke*, 23166 ; March 1939, *E. M. Doidge*, 32201 ; Garstfontein, Pretoria, March 1944, *E. M. Doidge*, 35019 ; *E. M. Doidge*, 35033 ; Silverton, Pretoria, March 1928, *L. Reinecke*, 23196b ; Barberton, Tvl., March 1924, *G. Thorncroft*, 18125 ; Sibasa, Zoutpansberg, Feb. 1920, *H. A. Junod*, 12825 ; Van Reenen, Dec. 1912, *M. Franks*, 5665 ; Sweetwaters, Natal, Dec. 1934, *A. Spencer*, 30831 ; Brenton, Knysna, *A. V. Duthie* 174, 31382 ; Kirstenbosch, Newlands, July 1934, *J. Acocks*, (*E. L. Stephens* 370) 27672 ; Umtali, S. Rhodesia, *F. Eyles* 4227 (*v. d. Byl* 2416) ; Salisbury, S. Rhodesia, April 1926, *F. Eyles* 4086 (*v. d. Byl* 2350) ; Durban, *van der Byl* 618 ; Schroeders, Natal, *van der Byl* 398 ; Kentani, C.P., 1906, *A. Pegler* 1425 a, as *G. Minimum*, 34449 ; Oct. 1908, *Pegler* 1370, 8418, 34450 and Kew ; Garstfontein, Feb. 1942, *A. M. Bottomley*, 35134 ; May 1944, *A. M. Bottomley*, 35135 ; Hermanus, C.P., May 1934, *Dr. MacPherson*, 31492 ; Bulwer, Natal, Feb. 1937, *W. G. Rump* 464, 35302 ; Montagu, C.P., April 1929, *D. v. H.*, 35025 ; July 1929, 35027.

Specimens not seen : Brenton, Knysna, *Duthie* 95, 235, 289 ; Sterkstroom, *du Plessis* (*Duthie* 214) ; Somerset Strand, C.P., *L. Verwoerd* (*Stell.* 124) ; South-West Africa, *Dinter*.

South African plants of this species appear to be distinguished from *Geaster triplex* to which it is closely allied, mainly by the nature of the underside of the exoperidium, which is usually tomentose—felted in *G. saccatum* and usually glabrous in *G. triplex*. The decision to use this character as a separating factor was based on an examination of numerous collections, comprising several hundred plants, many of the individual specimens of which could have been referred some to one species and some to the other if separated on other points. The exoperidial character was found to be the only well-defined, fairly constant point of difference between the two types occurring in this country. Both *Hollés* and *Coker* describe *G. saccatum* as having a felted mycelial layer, but *Cunningham* describes it as glabrous like *G. triplex*, referring plants with a felted layer to *G. velutinum*. *Cunningham* separated the Australian plants of the two species under discussion on characters such as spore size, shape of rays, nature of peristome, striate nature of the mycelial layer, but in South African plants these characters show so many gradations in one and the same collection that it is impossible to use them alone as a basis of distinction. *N. J. G. Smith* found the same difficulty, and following *Lloyd*, used size as the separating factor, referring expanded plants of more than 5 cm. diam. to *G. triplex* and smaller plants to *G. saccatum*. As pointed out by *Cunningham*, however, this character is very variable and therefore unsuitable. The South African plants can really only be separated on a combination of characters. Generally speaking large plants with acuminate rays, glabrous, longitudinally striate mycelial layer and large, dark, strongly verrucose spores are *G. triplex* and small to medium sized plants with wedge-shaped rays, felted mycelial layer and smaller, paler, less verrucose spores are *G. saccatum*. Intermediate forms, however, with characters of both species are not infrequent.

12. *Geastrum mirabile* Montagne, [Plate LVII, fig. 1.]

Annales des sciences naturelles, 3 Sér., 4 (1855) No. 595.

Sacc. Syll. Fung. 7 (1888) 79 ; *Lloyd, Myc. Writ.* 2, *Myc. Notes* 25 (1907) 313 ; *Cunningham, Gastero.* (1944) 171 ; *Coker & Couch, Gastero.* (1928) 116.

Geaster papyraceus Berk. et Curt., Proc. Am. Acad. Arts & Sci. 4 (1858) 124.

G. lignicola Berk., Journ. Linn. Soc. 18 (1881) 386.

G. caespitosus Lloyd, Myc. Writ. 2, Myc. Notes 25 (1907) 315.

Unexpanded plants superficial, small, often caespitose, obovate, with a slight umbo when dry, 4–5 mm. across, cream coloured, finely felted, attached to a whitish mycelial membranaceous subiculum. *Exoperidium* saccate, up to 9 mm. across, split to about one third into 5–6 bluntly pointed, suberect rays; *fleshy layer* pale brown, smooth, adnate, sometimes peeling off from the tips of the rays; *mycelial layer* cream coloured, finely felted to strigose, free from debris. *Endoperidium* sessile, 4–5 mm. across, brown, lower third enclosed by the saccate base of the exoperidium. *Mouth* broadly conical, fibrillose, concolorous or darker. *Gleba* umber. *Spores* globose, brown, 3·5–4 μ diam., finely verrucose.

Habitat : often caespitose on a subiculum growing over decayed vegetable debris.

Distribution : West and South Africa ; North and South America ; Australia ; Ceylon ; West Indies ; Japan.

Specimens examined : Rooikoppies, nr. Duivelskloof, Tvl., July 1939, Mr. Read (T.R.L. 199) 35022, det. Wakefield.

This species is distinguished from *G. saccatum*, to which it is nearly related, by its caespitose habit, cream colour, attachment to a membranaceous subiculum, generally smaller size, less sharply pointed button and slightly larger spores.

13. *Geastrum velutinum* Morgan, [Plate LVII, fig. 2.]

Journal Cincinnati Society of Natural History 18 (1895) 38.

Lloyd, Geastreae in Myc. Writ. 1 (1902) 33 ; Coker & Couch, Gastero. (1928) 113 ; G. H. Cunningham, Gastero. (1944) 170 ; N. J. G. Smith, Rec. Albany Mus. 4 (1935) 2.

? *Cycloderma ohiensis* Cooke et Morgan ex Cooke, Grevillea 2 (1883) 95.

Geaster Lloydii Bres. ex Lloyd, Myc. Writ. 1, Myc. Notes 6 (1901) 50.

Unexpanded plant subglobose or ovate and slightly pointed, superficial, attached to substratum by a well-developed mass of closely interwoven, white mycelial threads. *Exoperidium* 0·7–2·5 cm. across, splitting to about half way into 5–6 wedge-shaped, suberect or more or less expanded segments; *fleshy layer* cinnamon brown, usually smooth and adnate, sometimes cracking across the base of the rays; *mycelial layer* same colour as fleshy layer, finely felted to strigose. *Endoperidium* sessile, 7–12 mm. across, globose, greyish-brown, finely tomentose to glabrous. *Mouth* broadly conical, minutely fibrillose, seated on a slightly raised, almost concolorous, definite, circular area. *Capillitium* pale and thin, similar to spores in colour and diameter. *Spores* globose, dark brown, finely verrucose, 4–6 μ diam.

Habitat : on the surface of decayed vegetable debris.

Distribution : South and East Africa ; North and South America ; Australia ; New Zealand.

Specimens examined : without locality, 35292.

Specimens not seen : Eastern Cape Colony, figured by Marloth in Flora of South Africa, Pl. 3 ; Grahamstown, N. J. G. Smith G. 162 (Albany Mus.).

It seems unlikely that Smith's plant, called *G. velutinum* (l.c.) is the same as that described in the present work. It is more likely to be *G. saccatum* as here interpreted. Our *G. velutinum* plants are characteristic cinnamon brown and are not as expanded as most *G. saccatum*.

This species, like *G. mirabile*, is known from one collection only. Its distinguishing features are its mycelial attachment, its felted to strigose mycelial layer, the sub-erect habit and the colour. It is separated from *G. mirabile* by its larger size, distinctive brown colour (Snuff Brown to Cinnamon Brown) and usually large spores. It is distinguished from *G. saccatum* mainly by the colour of the mycelial layer which is quite free from debris, its usually more conical mouth, its sub-erect habit and its generally larger spores.

The only specimens available for comparison were two unexpanded plants distributed by Dümmer from Uganda.

14. **Geastrum arenarium** Lloyd, [Plate LVII, fig. 3.]

Geastreae in Myc. Writ. 1 (1902) 28.

N. J. G. Smith in Rec. Albany Mus., Grahamstown, 4 (1935) 273; G. H. Cunningham, Gastero. (1944) 174.

Unexpanded plant globose, small, originally submerged. *Exoperidium* hygroscopic, up to 3.5 cm. diam., splitting to the middle or beyond into 8-12 unequal, pointed segments, which are expanded when wet and incurved either above or, more often, below the endoperidium when dry; sometimes drying partly expanded; *fleshy layer* adnate, pale brown, sometimes peeling off and exposing the whitish fibrillose layer; *mycelial layer* covered with sand. *Base* strongly umbilicate. *Exoperidium* up to 1.6 cm. diam., subglobose, long or depressed globose, whitish or dove grey (Pallid Mouse Grey to between Tillul Buff and Avellaneous) more or less mealy when young, becoming almost glabrous; shortly pedicellate. *Pedicel* elliptical, sometimes with a slight apical apophysis. *Mouth* typically fimbriate, conical, acute, definite or sometimes indefinite, darker than rest of endoperidium or concolorous. *Gleba* ferruginous. *Columella* indistinct, if present. *Capillitium* threads varying in thickness to size of largest spores, pale brown. *Spores* globose, 3.5-5.1 μ diam., brown, finely verrucose.

Habitat: in sandy places.

Distribution: South Africa; North America; Australia.

Specimens examined: on sandy river bank, Tarkastad, C.P., O. West (N. J. G. Sm., G. 37) 27512; under *Acacia* trees, Mauritzfontein, Kimberley area, June 1936, J. P. H. Acocks 402, 28637; under *Eucalyptus*, Grahamstown, Nov. 1915, 9198; Fort Hare, Alice, Aug. 1934, Giffen, 27503.

Specimens not seen: Queenstown, R. Hall; Grahamstown, N. J. G. Smith, G. 173; Bolellacarp nr. Kuruman, J. V. L. Rennie.

This species is recognised by its hygroscopic habit, its shortly pedicellate endoperidium and fibrillose peristome.

15. **Geastrum mammosum** Chevallier.

Flora Paris (1836) 359.

Sacc. Syll. Fung. 7 (1888) 85; Lloyd, Geastreae in Myc. Writ. 1 (1902) 13; N. J. G. Smith, Rec. Albany Mus. 4 (1935) 274.

Exoperidium hygroscopic, thin, rigid, smooth, splitting almost to the base into 8-10 subequal, slender rays; *fleshy layer* chestnut brown, smooth; *mycelial layer* free of debris.

Endoperidium sessile, depressed globose, about 9 mm. diam., smooth, pale straw coloured, with a conical, even, protruding mouth seated on a large, silky, clearly defined zone. *Columella* short, globose, evident or not. *Capillitium* threads simple, tapeing, hyaline, slightly thinner than spores. *Spores* globose, verrucose, 3-7 μ diam. (Description after Smith l.c. and Lloyd l.c.)

Habitat : on ground in open or wooded places.

Distribution : South Africa ; North America ; Britain ; Europe.

South African record : near Swakop River, between Omaruru and Okahandja, South-West Africa, N. J. G. Smith, G. 98 ; this collection (Smith l.c.) consists of a single detached specimen.

This species is characterised by its hygroscopic habit, sessile endoperidium and even conical mouth.

16. ***Geastrum fornicatum*** (Hudson) Fries (pro parte typica), [Plate LVIII.]

Systema Mycologicum 3 (1821) 12 pp.

Hollós, *Gastero*. Ung. (1904) 62 ; Lloyd, *Geastreae* in *Myc. Writ.* 1 (1902) 29 ; N. J. G. Smith, *Rec. Albany Mus.* 4 (1935) 278 ; G. H. Cunningham, *Gastero*. (1944) 175.

Lycoperdon fornicatum Huds., *Flor. Angl.* ed. 1 (1762) 502, (pp.).

Geastrum quadridum v. *fenestriatum* (Batsch) Pers. *Syn.* (1801) 133.

Geastrum fenestriatum (Pers.) Fischer, *Natur. Pflanzenfam.* 7a. (1933) 73.

Unexpanded plant subglobose, ochraceous. *Exoperidium* typically fornicate, up to 4 cm. high (excluding cup), 5.5 cm. wide, splitting about two-thirds or more of the way into 4, occasionally 5, acuminate or long wedge-shaped segments, the tips of which remain attached to the corresponding tips of the mycelial layer, which, on expansion, remains behind in the substratum as a membranous, hollow, cup-shaped structure ; the fleshy and fibrous layers, carrying the endoperidium become strongly arched over it ; *fleshy layer* greyish brown to umber (Mars Brown, Vandyke Brown) at first smooth and adnate, later sometimes cracking and peeling off, either altogether or in patches, exposing the usually hard, greyish brown fibrous layer. *Endoperidium* pedicellate, up to 1.7 cm. across and 1.4 cm. high, depressed globose or urceolate, often with a circular basal apophysis just above the pedicel, greyish brown to purplish black (Mouse Gray, Light Drab, Drab, Vandyke Brown), velvety, smooth or obscurely granular. *Mouth* indefinite, conical or mammose, with fibrillose or lacerate apex. *Pedicel* whitish, elliptic, up to 2 mm. long and 5 mm. wide. *Gleba* umber with purplish tinge. *Columella* small, hemispherical. *Capillitium* threads brown, up to 7 μ diam. *Spores* globose, finely but sparsely verrucose, brown, 4.5-1 μ diam.

Habitat : in humus under bushes and trees.

Distribution : South Africa ; Australia ; North America ; Britain ; Europe ; West Indies.

Specimens examined : Platrivier, Pretoria Distr., Nov. 1911, P. J. Pienaar, 1966, det. Lloyd ; Saltpan, west of Waterpoort, N. Tvl., Dec. 1932, H. Schweickhardt, 26623 ; Belvidere, Knysna, A. V. Duthie 95, 31349 ; Kimberley, Oct. 1918, M. Wilman, 12317 ; under *Acacia*, Mauritzfontein, Kimberley Distr., June 1936, J. P. Acocks 401, 28636 ; Trappe's Valley, Bathurst Distr., C.P., Aug. 1919, H. Cronwright (N. J. G. Smith G. 9) 12466 ; Kentani, Jan. 1916, A. Pegler 2386, 9419 ; Knysna, A. V. Duthie (v. d. Byl 1092) ; June 1921, Eyles 6658 (S. Rh. 3861) ; Durban, April 1917, Leslie (N.H. 744) 32486.

Specimens not seen : Tarkastad, O. West [N. J. G. Smith, G. 33 as *G. fenestriatus* (Pers.) G. H. Cunn.]; Commadagga, Somerset East Distr. (Alb. Mus. G. 96 as *G. fenestriatus*); Kimberley (Herb. Wit. 234); Cape of Good Hope, MacOwan as *G. MacOwani* Kalchbr.; without locality, Prof. Plöttner.

Typical plants are distinguished by the strongly fornicate habit and the indefinite, apically fimbriate mouth. The South African plant appears to differ from the typical European plant mainly in smaller size and larger spores. It more nearly resembles the Australian and the North American form.

This species is distinguished from the plant here described as *G. coronatum* by the indefinite, non-margined mouth, larger and darker spores and thicker capillitium.

17. **Geastrum Hieronymi** P. Hennings, [Plate LXIX, lower row.]

Beiträge zur Pilzflora Sudamerikas II, in Hedwigia 36 (1897) 211.

Lloyd, Myc. Writ. 2, Myc. Notes (1907) 311, Pl. 97; Myc. Writ. 7 (1923) 1176; Verwoerd, Ann. Univ. Stell. 3 (1925) 22; N. J. G. Smith, Rec. Albany Mus. 4 (1935) 279.

Exoperidium expanded or with rays revolute, splitting to about the middle or more into 8–10 subequal, acuminate rays 1–2 cm. long; *fleshy layer* umber, sometimes with paler margin around rays, 4–6 cm. diam., almost smooth at first, becoming rimosely or longitudinally cracked; *mycelial layer* adnate, covered with debris, ochraceous or greyish brown, sometimes breaking away. *Base* deeply concave or vaulted. *Endoperidium* pedicellate, ovoid, subglobose or depressed globose, 1.5–2.5 cm. diam., with or without a basal apophysis, shortly stipitate, umber or blackish umber, minutely but densely and harshly asperate; spicules black, erect, sharp pointed. *Mouth* indefinite, fimbriate, concolorous with, or a shade darker than the rest of peridium. *Pedicel* broad elliptic, 1–2 mm. long, with scattered spines. *Gleba* blackish umber. *Capillitium* varying in thickness and colour from tinted to almost as dark as spores, and from thin to slightly thicker than spore diameter. *Spores* globose, dark brown, sparsely verrucose, average size 4 μ .

Habitat : on ground amongst vegetable debris.

Distribution : North and South America; South Africa.

Specimens examined : Knysna, A. V. Duthie 290 (v. d. Byl 1091; Stell. 125) 31460; Platrivier, Pretoria Distr., Nov. 1911, P. J. Pienaar, 1967; Kromrivier nr. Marikana, Transvaal, Dec. 1938, E. M. Doidge and A. M. Bottomley, 35121; Stellenbosch, C.P., April 1923, F. Eyles, 6756.

Specimens not seen : under plants, Grahamstown, N. J. G. Smith.

This is a very dark species, distinguished by its minutely, but densely and harshly asperate endoperidium. Hennings describes the spicules as resembling those of *Lycoperdon perlatum*. It is very near *G. fimbriatum* except that the endoperidium of the latter is sessile and smooth.

18. **Geastrum floriforme** Vittadini, [Plate LXIX, upper row.]

Monographia Lycoperdineorum (1842) 23.

Sacc. Syll. Fung. 7 (1888) 87; Verwoerd, Ann. Univ. Stell. 3 (1925) 21; N. J. G. Smith in Rec. Albany Mus. 4 (1935) 277; G. H. Cunningham, Gastero. (1944) 177.

Geaster delicatus Morg., American Nat. 21 (1887) 1028.

G. hungaricus Hollós, Gastero. Ung. (1904) 64.

G. Pazschkeanus P. Henn., Hedwigia 39 (1900) 55; Sacc. Syll. Fung. 16 (1902) 239.

Unexpanded plant subglobose, depressed globose, sometimes pointed at the apex, dirty white, at first submerged, then entirely superficial. *Exoperidium* 2.5–3.5 cm. diam. when expanded, splitting from a half to two-thirds of the way into 5–11 subequal, acuminate segments, strongly hygroscopic, folded over the peridium when dry, saccate with tips expanded or revolute when moist; *fleshy layer* smooth or transversely cracked, bay to umber brown; *mycelial layer* thin, whitish, at first with adherent sand, more or less disappearing, exposing the smooth, brown, fibrous layer. *Base* slightly umbilicate or rounded with point of attachment present. *Endoperidium* sessile, 9 mm. to 1.5 cm. diam., subglobose, parchment coloured to light brown, almost smooth. *Mouth* a torn aperture, indefinite, naked, slightly conical or plane, becoming fibrillose. *Gleba* nigger brown. *Columella* minute, white, rounded. *Capillitium* threads varying in thickness up to diameter of largest spore, almost hyaline to light brown. Spores usually globose, sometimes subglobose, strongly verrucose, 3.6–7 μ diam.

Habitat : singly or gregarious on ground.

Distribution : South Africa ; North America ; Australia ; Europe ; New Zealand.

Specimens examined : Pretoria, Nov. 1909, *Doidge*, 957 ; *P. J. Pienaar*, Nov. 1911, 1968, det. Lloyd ; Krugersdorp, Tvl., Oct. 1928, *A. J. Pretorius*, 23625 ; Matatiele, E. Griqualand, Oct. 1932, *Gideon Joubert*, 26577 ; Raapenberg Golf Course, Cape Peninsula, Aug. 1938, *M. A. Pocock* (*E. L. Stephens* 218) 27272 ; Stikland, Bellville, C.P., July 1932, *J. Acocks*, 27274, Stellenbosch, *v. d. Byl*, 1107 ; May, 1923, *v. d. Byl*, 1105 as *G. striatulus*, *G. C. Nel* (*v. d. Byl* 1139) as *G. striatulus* ; Stellenbosch, April 1921, *Eyles* 6756 ; Brandfort, O.F.S., Feb. 1925, *L. Verwoerd* (*v. d. Byl* 2083) as *G. striatulus* ; Elsenburg, C.P., Oct. 1926, 35029.

Specimens not seen : Eastern Cape, *N. J. G. Smith* *G. 19*, *G. 28* ; Grahamstown, *G. 90* ; Devil's Peak, Cape Town, amongst leaves at foot of *Leucadendron* tree 1894, *MacOwan*, Kew ; Cape Province, *Paszchke* as *G. Paszchkeanus*.

19. *Geastrum hygrometricum* Persoon, [Plate LX.]

Synopsis Methodica Fungorum (1801) 135.

Sacc. Syll. Fung. 7 (1888) 90 ; Verwoerd, S. Afric. Journ. Sci. 23 (1926) 291 ;

G. H. Cunningham, *Gastero.* (1944) 178.

Geastrum fibrillosum Schw., Nat. Gesell. (1822) 113.

Geaster vulgaris Corda, Icon. Fung. 5 (1842) 64.

Astraeus hygrometricus (Pers.) Morgan, Journ. Cincinnati Soc. Nat. Hist., 12 (1889) 20.

Geaster lilacinus Mass., Kew Bull. (1899) 166.

Astraeus stellatus (Scop.) Fischer, Nat. Pflanzenfam. 1 (1900) 341.

Unexpanded plant 4–7 cm. diam., globose or depressed globose, bay-brown, rooting by a few fine threads, submerged at first, finally completely superficial. *Exoperidium* very hygroscopic, 5–10 cm. diam. when expanded, splitting to two-thirds to three-quarters of the way into 5–20 thick, woody, subequal, acute segments, which are strongly incurved over the endoperidium when dry, but in wet weather expand and turn back, until the plant is lifted off the ground and rests on the tips of the segments; *fleshy layer* light brown or greyish (between Deep and Dark Olive Buff) in fresh specimens, finally yellowish, greyish, dark brown to almost black in weathered specimens; thin, often cracking rimosely or into sections, giving the segments a mottled or shagreen appearance; *mycelial layer* thin, tearing away as the plant expands, exposing the smooth, polished, brown fibrillose layer. *Endoperidium* 2–3.3 cm. diam., globose or depressed globose, sessile, thin, membranaceous, at first covered with an olive green, woolly covering, leaving the peridium smooth and Buff

Brown flecked with Citrine Drab in colour. *Mouth* indefinite, a torn aperture without a peristome. *Gleba* umber. *Capillitium* threads long, attenuated, branched, pale brown, 3.5–7 μ diam. Spores globose, verrucose, 5–10 μ diam.

Habitat : solitary or gregarious, occurring sporadically in rainy seasons, in manured or other ground.

Distribution : South Africa ; North and South America ; Australia ; Europe ; India.

Specimens examined : in manured ground, Somerset East, 1874, *MacOwan* 1060 (S.A. Museum 35065), 35305 ; on hard ground under pine trees, Pretoria, April 1925, *A. M. Bottomley*, 20421 ; March 1929, 23724 ; April 1930, *P. Watson*, 25435 ; Feb. 1946, *B. Louwrens*, 35524.

Other South African Records : Marloth (Flora S. Afric. 1, 1913 : 21) says of this plant : "The common *G. hygrometricus* is of universal occurrence".

This species is recognised by its large size, very woody exoperidial segments, rigidly incurved habit when dry, and picturesque habit of standing on the tips of its segments when wet. In the latter condition it reminds one of some sea animal.

Cunningham is followed in retaining this species in *Geastrum* rather than Morgan and Fischer who referred it to a separate genus—*Astraeus*. According to the first-named, it differs from other *Geastrums* only in having a somewhat primitive hymenium, which is, however, not evident at maturity.

Doubtful Species.

Geaster MacOwani Kalchbr. [Plate LXI, fig. 1.]

Grevillea 10 (1882) 108.

"*Habitu G. fornicati* Fr. sed. triplo major. Peridium extereus quadrifidum, laciniis ovato-lanceolatis, peridium interius breviter stipitatum, glabriusculum, sporae fusco-purpureae.

C.B. Sp., leg. MacOwan.

Orificium—proh dolor—totam destructum sed numerus loborum et color sporarum characteres bonos praebet".

No specimen of this species appears to have been deposited in any South African Herbarium. Mr. Talbot, to whom a specimen of *G. dissimile* n. sp. was referred for comparison with the Kew material of *G. MacOwani*, has supplied the following note :—"There is only one specimen in Kew called *G. MacOwani*. It was collected by MacOwan in the Cape, identified originally as *G. limbatus* from which it was transferred by Lloyd, who has labelled it *G. fornicatus* Huds. form *MacOwani* Kalchbr. This specimen corresponds very well with Lloyd's illustrations (Myc. Writ. 2, 1907 : Plate 96) of Prof. Plöttner's material, but it is not the same as your specimen (*G. dissimile*). Furthermore it seems doubtful whether Lloyd's conception of *G. MacOwani* is the same plant as Kalchbrenner described (l.c.). *G. MacOwani* is stated to be three times as large as *G. fornicatus* (European form) which in turn is much larger and coarser than 14515 (*G. dissimile*) and also larger than the specimen called forma *MacOwani* by Lloyd. *G. MacOwani* is further confused by having been described from material in which the mouth was totally destroyed."

Excluded Species.

Verwoerd (Ann. Univ. Stell. 3, 1925 : 41) lists *Geaster affinis* Colenso and *G. coriaceus* Colenso as South African species, but he has obviously mistaken the name of the author for

a South African town of the same name. These are both New Zealand or Australian species. According to Cunningham (Gastero., 1944 : 173) *G. coriaceus* is a synonym of *G. triplex* and *G. affinis* (l.c., p. 211) is probably a synonym of the same species.

9. MYRIOSTOMA Desvaux.

Journal de Botanique 2 (1809) 103.

Lloyd, Geastreae in Myc. Writ. 1 (1902) 6 ; Verwoerd in Ann. Univ. Stell. 3 (1925) 24.

Lycoperdon Dickson, Plant. Crypt. Brit. 1 (1785) 24.

Gastrum Persoon, Syn. (1801) 131.

Geaster Auct. var.

This genus resembles *Gastrum* in all respects, except that the endoperidium dehisces by several mouths, and has several pedicels and columellas instead of one. It is represented by the single species *Myriostoma coliforme*.

Myriostoma coliforme (Dickson ex Persoon) Corda., [Plate LXI, fig. 3-4.]

Hazslinsky, Magyarhon Lasgombai (1875) 11 ; Corda, Anleitung zum Studium der Mycologie (1842) Tab. D.

Hollós, Gastero. Ung. (1904) 46 ; Verwoerd, Ann. Univ. Stell. 3 (1925) 241

Coker & Couch, Gastero. (1928) 138.

Lycoperdon coliforme Dickson, Plant., Crypt. Brit. 1 (1785) 24.

Gastrum coliforme Dickson ex Persoon, Synops. Fung. (1801) 131.

Myriostoma anglicum Desv., Obs. in Journ. Bot. 2 (1809) 104.

Geaster coliformis Dickson ex Persoon, Kalchbrenner, Grev. 10 (1882) 108 ; P. Hennings, Engl. Bot. Jahrb. 14 (1892) 361.

Geaster columnatus Lév., Champignons de Mus. de Paris, p. 161.

Bovistoides simplex Lloyd, Myc. Writ. 6, Myc. Notes '61 (1919) 883.

Exoperidium 5-9 cm. diam., greyish brown or dull cinnamon, membranaceous, splitting to about half-way into 6-10 pointed, usually smooth segments ; *fleshy layer* adnate, firm and rigid at first, later peeling off, leaving the segments thin, membranaceous and a dirty white colour ; *mycelial layer* brown, smooth, with adhering debris, partly disappearing. *Endoperidium* 2-4.5 cm. diam., subglobose or depressed-globose, scabrous, brownish with shiny leaden grey effect, pedicellate, supported on several, more or less confluent, columnar structures, dehiscing by 7-15 indefinite mouths, which resemble torn apertures and are round or elliptic, plane or slightly elevated and scattered over the upper part of the endoperidium. *Gleba* umber brown. *Capillitium* threads pale brown, unbranched, tapering, 3.5-4 μ diam. *Columella* present, filiform, number probably corresponding with number of pedicels supporting endoperidium. *Spores* globose, strongly verrucose to almost papillate, pale brown, 3-7 μ diam.

Habitat : in open ground or leaf mould under trees, solitary.

Distribution : South Africa ; North and South America ; England ; Europe.

Specimens examined : Pretoria, April 1914, *H. A. Wager*, 7726 ; Wonderboom, Pretoria, June 1916, *L. Kresfelder*, 9793 ; March 1917, 10048 ; Pelindaba, Pretoria Distr., Feb. 1930, *P. Watson*, 24952 ; nr. Grahamstown, Sept. 1941, *L. Britten*, 33382 ; Alicedale,

F. Cruden, 12958; Knysna, *Duthie 112* (v. d. Byl 1090) 31355; Garstfontein Rd., Pretoria, May 1944, *A. M. Bottomley*, 35166; Ubombo, Zululand, *Bell Marley* (v. d. Byl 870); Stikland, C.P., July 1932, *J. P. H. Acocks* (E. L. Stephens 135); Brackenfel, C.P., Feb. 1933, *J. P. H. Acocks* (E.L.S. 171); May 1932, *E. L. Stephens 116*; Heathfield, Aug. 1937, *D. Cousins* (E.L.S. 443); Blikfontein, Kimberley area, Dec. 1937, *J. P. H. Acocks 2585*, 35301; Boschberg, *MacOwan 1234* (S.A.M. 35056) 21940; Huisrivierbergen, v. d. Byl 1071.

Specimens not seen: Belvidere, Knysna, *Duthie 59, 95*; without locality, Transvaal, v. d. Byl; Grahamstown, N. J. G. Smith; Cradock, M. Gush; Somerset East, MacOwan.

10. GEASTEROPSIS Hollós.

Növénytani Közlemények 2 (1903) 72.

Geasteroides W. H. Long, Mycologia 9 (1917) 24.

Peridium double. Exoperidium thick, rigid, splitting, as in *Geastrum*, from the apex downwards to about the middle, into irregular reflexed segments; closely investing the endoperidium. Endoperidium thin, membranaceous, more or less deciduous, enclosing a central structure, which arises from the base of the exoperidium and consists of a persistent, stipitate columella, which bears the capillitium and spores.

Long (l.c.) states that his genus *Geasteroides* differs from *Geasteropsis* in having a sterile persistent base to which the lower part of the endoperidium is firmly attached, whereas, according to the description and figures given by Hollós, the dehiscent endoperidium of *Geasteropsis* encloses the subligneous stipe and columella, making quite a different plant from *Geasteroides*.

In the specimens described later, believed to be *Geasteropsis*, the endoperidium appears to be originally attached to the exoperidium around the base of the stipe, thus enclosing the stipe with columella and gleba. One specimen in a South African collection indicates that the endoperidium may originally have been attached to the stipe slightly above its base, but even so it virtually encloses the stipe, columella and gleba. In any case the endoperidium is not firmly attached to the stipe as described by Long for *Geasteroides*. No specimen of the latter genus has been seen so no comparison is possible. Fischer is followed in including *Geasteroides* in *Geasteropsis*.

This genus differs from *Geastrum* and *Myriostoma*, to which South African genera it is most nearly related, by the manner of dehiscence, which, in *Geasteropsis*, is effected by the rupturing of the endoperidium, instead of by one or more apertures in the persistent endoperidium.

Three species have been described for this genus, *G. texensis* (Long) Ed. Fisch., from Texas, *G. Stahelii* Ed. Fisch. from Surinam and *G. Conrathii* Hollós.

Geasteropsis Conrathii Hollós, [Plate LXII; LXIII.]

Növénytani Közlemények 2 (1903) 72.

Peridium double, subglobose or obovate, dirty white, smooth, dull or shiny; originally attached by a smooth, thick, solid, whitish root-like structure; expanded plant varying from 7–16 cm. tall and 8–20 cm. broad. *Exoperidium* splitting from the apex downwards, to about the middle, into 8–10 pointed, reflexed or incurved segments, which are finally woody, hard and brittle, up to 6 cm. thick when soaked and consisting of three layers—an inner thin, dirty white, finally brownish grey layer, a thick, punky, brown middle layer and an outer white, compact, fibrous layer. With expansion, the inner and middle layers

become fissured and cracked, exposing the dirty white or brownish fibrous layer. *Endoperidium* thin, soft, membranaceous, pale brownish grey or dove grey, enclosing a central structure consisting of the gleba-bearing stipitate columella, originally attached at the top to the apex of the unexpanded exoperidium and at the bottom to its base, around the foot of the stipe of the columella. When the exoperidium splits at the apex, and the segments separate, the endoperidium breaks away at the top and partly or entirely at the bottom, remaining behind either as a torn, loose, collar-like structure around the base of the gleba or as torn fragments partly attached to the exoperidium thus partially or completely exposing the gleba. *Gleba* up to 2 cm. diameter exclusive of columella stipe, dark chocolate brown or blackish, consisting of closely packed, pale yellowish brown, irregular, fibrillose tramal strands, attached to and radiating from the massive columella, intermixed with capillitium and spores. *Columella* whitish, tough, subwoody, subglobose or elliptic, stipitate, broader than tall, 2-5 cm. tall and 1.4-6 cm. broad. *Stipe* cylindric or elliptic, in former case 2 mm. diam. by 0.5-1.3 cm. long, in the latter 3 cm. broad by 8 mm. thick and 2-7 mm. tall, arising from the outer, fibrous layer of the exoperidium. The enlarged apex of the stipe forms the columella. *Capillitium* threads sparse, hyaline to light brown, smooth, unbranched and only occasionally septate, diameter less than that of the spores. At maturity the gleba disintegrates and falls away from the columella, leaving the latter almost bare. *Spores* globose, olivaceous brown or dark brown, strongly verrucose, 5-8.5 μ diam., commonly 6.8 μ .

Habitat : on termite heaps and on ground, occurring singly.

Distribution : South Africa.

Specimens examined : on ground, Garstfontein, Pretoria Distr., April 1912, *P. J. Pienaar*, 2278 ; on termite heaps, Rietvlei Pasture Research Station, Pretoria Distr., May 1940, *J. P. H. Acocks* 12346, 34141 ; on termite heap, Clarens, O.F.S., July 1946, *J. E. v.d. Plank*, 35574 ; Danielskuil, Clanwilliam Distr., C.P., April 1940, *E. Esterhuyisen* (E.L.S. 510).

Specimen not seen : on granite soil, Modderfontein Dynamite Factory, Johannesburg, 1902, *P. Conrath*, Hollós, *Type* of genus and species.

The characteristics of this plant are the woody exoperidium, the fugacious endoperidium and the large, woody, stipitate columella, to which radiating, fibrillose strands intermingled with the capillitium threads are attached.

I am indebted to Miss Wakefield for the identification of specimens No. 34141, and for a copy of Hollós description of the species.

TULOSTOMATACEAE.

The Tulostomataceae is the second family of the Order Lycoperdales and differs from Lycoperdaceae, the first family, mainly in the stem character, which is well developed in the Tulostomataceae but absent, or only very poorly developed, in Lycoperdaceae.

The Tulostomataceae is a comparatively small family, containing, according to Cunningham, only seven genera :—*Tulostoma*, *Batarrea*, *Phellorina*, *Chlamydopus*, *Podaxis*, *Schizostoma* and *Dictyocephalos*, and these, with the exception of *Tulostoma*, contain only one to four species. Of the above seven genera only the first five are represented in South Africa.

Cunningham rather than Fischer is followed in the arrangement of this family, the argument of the former in favour of his arrangement being that although the genera in question show considerable diversity of form and development, they are grouped together because they have the ordinal characters in common, with, in addition, a well developed true stem.

The general characters of the family are as follows:—

Plants consisting of a peridium attached to a well developed stalk. Peridium sub-globose, depressed globose or long oval. Exoperidium 2-layered, scaly or continuous, persistent or fugacious. Endoperidium tough, membranous and persistent, except for *Batarrea* in which it falls away in one piece. Dehiscence by means of a stoma, by irregular rupture, by circumscissile splitting or by basal separation from the stem followed by longitudinal splitting. Stem woody and well developed, carrying the peridium upon its modified apex, except in the case of *Podaxis*, where it is prolonged to the apex of the peridium; provided with a volva-like structure at the base. Gleba pulverulent, consisting of copious spores and capillitium threads. *Capillitium* threads simple, sparingly branched, sparsely septate, hyaline or coloured. In *Batarrea* elaters are present mixed with the threads. Basidia fasciculate or in normal palisade arrangement on tramal plates. Spores globose or oval, hyaline to coloured, usually rough.

Key to the Genera.

Sub-family Tulostomoideae. Basidia not in fascicles, disappearing at maturity.

A. *Tulostomeae*. Elaters not present in the gleba.

Peridium dehiscing by a definite stoma; capillitium septate..... 1. **Tulostoma**.

Peridium dehiscing by irregular rupture of the apex; capillitium not septate..... (Schizostoma).

B. *Batarreae*. Elaters present in the gleba.

Peridium dehiscing by circumscissile cleavage of the apical portion... 2. **Batarrea**.

Sub-family Podaxonoideae. Basidia in fascicles which persist at maturity.

C. *Phellorineae*. Peridium seated on the expanded apex of the stem.

Peridial wall continuous with the stem forming a cupulate extension of the stem apex..... 3. **Phellorina**.

Peridial wall not continuous with the stem.

Peridium dehiscing by a definite stoma; gleba pulverulent..... 4. **Chlamydopus**.

Peridium dehiscing by irregular rupture of the apical portion; gleba coarsely chambered..... 5. **Dictyocephalos**.

D. *Podaxineae*. Peridium borne at the apex of a stem which traverses the gleba as an axile columella; dehiscing by longitudinal splitting.

Characters as above..... 6. **Podaxis**.

1. TULOSTOMA Persoon.

Synopsis Methodica Fungorum (1801) 139.

Tylostoma Spreng., Syst. Veg. 4 (1829) 378.

Tulasnodea Fr., Summa Veg. Scand., Pt. 2 (1849) 440.

Type species: *Tulostoma brumale* Pers.

Plants consisting of a stalked peridium in which the stalk is inserted in a depression at the base of the peridium. Peridium depressed globose, sometimes with a collar-like structure at the base. Exoperidium usually fugacious in the upper part of the peridium, but persistent at the base as an irregular, shallow disc. Endoperidium thin, tough, membranaceous, smooth or rough with fragments of the exoperidium, dehiscing by an apical

round, oval or elliptic mouth, which may be fibrillose, tubular, elevated or plane. Stalk inserted in a depression at the base of the peridium, woody, fistulose, often brittle, smooth or scaly, often striate or sulcate-striate, stuffed, usually with a small mycelial bulb at the base. *Gleba* pulverulent, consisting of capillitium threads and spores. Capillitium composed of long, usually branched, septate threads attached to the endoperidium. Spores globose, subglobose or occasionally angled, usually rough, occasionally smooth. "*Basidia* clavate, bearing laterally 2-4 spores on short sterigmata."

Tulostoma is the largest genus of the family Tulostomataceae, comprising some 85 described species, of which however, according to Cunningham, only about 30 are good. Probably about a dozen species are represented in South Africa. The genus is of world-wide distribution, occurring most commonly in dry, sandy regions. With the exception of two or three species which grow on wood, the species all occur on the ground. The chief characteristic of the genus is the stem, which is inserted into a depression at the base of the peridium. Only one other genus, namely *Schizostoma* has a stem of this nature. From *Schizostoma* however, *Tulostoma* differs in having a well-developed mouth and septate capillitium threads.

The genus is very imperfectly known in South Africa, the National Herbarium being sadly lacking in specimens of authentically named species. In the absence of named specimens for comparison and of facilities for studying overseas plants, great difficulty has been experienced in placing South African forms. However, rather than omit mention of many of the collections, it has been considered advisable, for the sake of future workers, to refer them tentatively to described species with which by comparison with descriptions and illustrations they seem most nearly to agree. Hollós, Lloyd, Coker and Couch and Cunningham have been the main sources of information.

The classification of the genus has been based, as is the usual custom, on the mouth characters. These are of three types: (1) definite, tubular and entire, (2) definite and fibrillose-fimbriate and (3) indefinite and plane, often resembling a torn aperture. Apart from the mouth, the spores appear to be the only other distinctive and variable character.

Key to the Species.

Mouth short, tubular, entire

- | | |
|--|--------------------------|
| Spores typically small, 3.4-4.2 μ , obscurely verrucose..... | 1. <i>T. Lesliei</i> . |
| Spores typically large, up to 10 μ . | |
| Spores obscurely to finely verrucose, 5-10 μ | 2. <i>T. album</i> . |
| Spores finely to distinctly verrucose, 4-6.8 μ . | |
| Peridium large, up to 3 cm. diam..... | 3. <i>T. Purpusii</i> . |
| Peridium small, up to 1.5 cm. diam..... | 4. <i>T. albicans</i> . |
| Spores typically medium sized, up to 6.8 μ . | |
| Spores finely echinulate. Mouth pale..... | 5. <i>T. bonianum</i> . |
| Spores strongly but sparsely echinulate. Mouth dark..... | 6. <i>T. brumale</i> . |
| Spores verrucose, peridium reddish brown or pale tan..... | 7. <i>T. squamosum</i> . |
| Spores verrucose or shortly aculate, peridium white..... | 8. <i>T. lacticeps</i> . |

Mouth fimbriate-fibrillose

- | | |
|--|-----------------------------|
| Spores small, 3.4-5 μ , finely verrucose..... | 9. <i>T. cyclophorum</i> . |
| Spores large, 6-7 μ , strongly aculate..... | 10. <i>T. Transvaalii</i> . |
| Spores large, 5.5-7 μ , minutely and sparsely verrucose..... | 11. <i>T. MacOwani</i> . |
| Spores medium, 4-6 μ , more or less smooth..... | 12. <i>T. obesum</i> . |

Mouth indefinite, a torn aperture

- | | |
|--|------------------------------|
| Spores relatively smooth, 4-6 μ | 13. <i>T. australianum</i> . |
| Spores finely and sparsely echinulate, 4-6.8 μ | 14. <i>T. adherens</i> . |

1. *Tulostoma Lesliei* van der Byl.

Transactions Royal Society of South Africa 9 (1921) 185.

Verwoerd, Ann. Univ. Stell. 3 (1925) 12.

Peridium subglobose or depressed globose, 7–9 mm. diam. *Exoperidium* disappearing from upper part of peridium but persistent at base. *Endoperidium* whitish to pinkish buff, smooth, membranous. *Mouth* round, tubular, elevated, sometimes surrounded by a slightly darker zone. *Stalk* 1.5–2 cm. long, 1–1.5 mm. thick, irregularly and distinctly striate, fistulose, equal, straight or twisted, with a few pointed, membranous scales at the apex. *Gleba* rusty brown. *Capillitium* hyaline to tinted, sparingly branched, fairly frequently septate, swollen and darker at the septa. *Spores* globose or subglobose, pale yellowish brown, obscurely verrucose, 3.4–4.2 μ diam.

Habitat : sandy soil.

Distribution : Natal ; South Africa.

Specimens examined : Durban, *P. van der Byl* 57, *Type* and *P. v. d. Byl* 690, 31896.

This species differs from *Tulostoma albicans* in the shorter, thinner stalk and smaller spores. It is recognised by its light coloured endoperidium, elevated, tubular mouth and small, obscurely verrucose spores.

2. *Tulostoma album* Massee.

Grevillea 19 (1891) 95.

G. H. Cunningham, Gastero. (1944) 183.

Tylostoma mcalpinianum Lloyd, Myc. Writ. 2, Tylostomeae (1906) 15.

Peridium subglobose, 7–8 mm. diam. *Exoperidium* chestnut brown, disappearing from the upper part but persisting at the base, mixed with sand and leaf debris, to form a closely adhering disc. *Endoperidium* dirty white or parchment coloured, smooth except for scattered grains of sand, tough, membranous. *Mouth* circular, shortly tubular, entire, becoming somewhat lacerated. *Stem* 2–2.5 cm. long, 2–3 mm. thick, dark brown, fistulose, coarsely striate, somewhat lacerated when the pale brown or yellowish, shining under surface is exposed, expanded at base. *Capillitium* threads hyaline and tinted, rather sparingly branched, sparsely septate, slightly swollen at the septa, varying in thickness up to 10.2 μ . *Spores* globose or subglobose, pale brown, thick-walled, varying considerably in size, 5–10 μ , average size about 6 μ diam., obscurely and finely verrucose (almost smooth in lacto-phenol).

Habitat : on ground.

Distribution : South Africa ; Australia.

Specimens examined : in sheep kraal, Allandale Farm, Bathurst, C.P., Sept. 1935, *K. M. Putterill*, 28528.

The plants of the above collection are tentatively placed in *T. album* until further specimens are available for examination and an opportunity is afforded to compare them with authentically named specimens. The description given differs from that of Cunningham (l.c.) in the rather larger and smoother spores.

According to Cunningham (l.c.) *T. mcalpinianum* is the same as *T. album*. Lloyd (l.c.) described the spores of the latter as almost smooth while Cunningham found them to be coarsely verrucose. This divergence of opinion may be due to a difference in the mountant used for examination.

This species is recognised by its short tubular mouth, light coloured endoperidium and usually large spores which are relatively smooth.

3. **Tulostoma purpusii** P. Hennings, [Plate LXVI, fig. 3.]

Hedwigia 37 (1898) 274.

Lloyd, Myc. Writ. 2, Tylostomeae (1906) 18, Pl. 79; Verwoerd, Ann. Univ. Stell. 3 (1925) 12; G. H. Cunningham, Gastero. (1944) 185.

Peridium globose or depressed globose, 1.5–3 cm. diam. *Exoperidium* dark brown, mixed with sand, peeling off in irregular patches from the upper part but persistent at the base. *Endoperidium* thin, firm, smooth, dirty white, pale ochraceous, greyish brown, ferruginous or sometimes pale with ochraceous brown patches. *Mouth* 2–4 mm., round or oval, entire, slightly protruding, usually single but occasionally several. *Stalk* 2–4 cm., sometimes up to 8 cm. long and 2–6 mm. thick, single, or occasionally several anastomosed together, pale ochraceous, fistulose, striate, often scaly, with small mycelial bulb at base. *Gleba* rusty brown. *Capillitium* threads hyaline to tinted, varying in thickness up to 6.8 μ diam., sparingly branched, sparsely septate, slightly swollen at septa. *Spores* ochraceous brown, globose, subglobose or rather irregular, finely but distinctly verrucose, typically large, 4–6.8 μ .

Habitat: in sandy soil, single, gregarious, sometimes caespitose.

Distribution: South Africa.

Specimens examined: Stellenbosch, May 1923, *F. Eyles* (v. d. Byl 1132, 1134); June 1928, *A. V. Duthie* (E.L.S. 66); in wattle plantation, Donnybrook, Natal, 1936, *K. E. Morgan* and *E. M. Doidge*, 30272; Jan. 1935, *E. M. Doidge*, 27717; Feb. 1935, *K. E. Morgan*, 28910; Bloemfontein, *G. Potts*, 11690; Xumeni Forest, Donnybrook, Natal, Dec. 1940, *E. M. Doidge*, 35336.

The distinguishing features of this species are its unusually large size, and finely but distinctly verrucose spores. It differs from the next species in the typically larger size.

4. **Tulostoma albicans** White, [Plate LXVI; LXVIII.]

Bulletin Torrey Botanical Club 28 (1901) 428.

G. H. Cunningham, Gastero. (1944) 182; Lloyd, Myc. Writ. 2, Tylostomeae (1906) 15; W. H. Long, Gastero. XIII in Mycologia 38 (1906) 172.

Tulostoma pallidum Lloyd, Myc. Writ. 2, Tylostomeae (1906) 15.

T. Mohavei Lloyd, Myc. Writ. 6 (1920) 992.

Peridium depressed globose, 0.6–9 mm. high, 0.7–15 mm. wide, often with a crown of pointed scales at the base. *Exoperidium* disappearing entirely or in patches from the upper part, but persisting at the base as a shallow disc. *Endoperidium* dingy white or pale ochraceous, smooth or flecked with particles of exoperidium, tough, membranaceous. *Mouth* usually one, occasionally two, apical, usually round, sometimes elliptical, shortly tubular, margin even at first but may become dentate. *Stem* 1–4 cm. long, 1–3 mm. wide, ochraceous to reddish brown, striate to coarsely sulcate, more or less equal, bulbous at base. *Gleba* rusty brown. *Capillitium* threads hyaline to tinted, branched, sparsely septate, often somewhat swollen at septa, rounded at ends, up to 6.8 μ diam., equal or irregularly thickened. *Spores* globose, subglobose or sub-angled, sparsely but finely to coarsely verrucose, golden brown with darker episore, 4–6.8 μ diam.

Habitat: in sandy or heavy ground.

Distribution: South Africa; North America; Australia; India; Tasmania.

Specimens examined: on antheap tennis court, Ladybrand, Feb. 1926, *P. L. Lefebre*, 20672; Fountains, Pretoria, Dec. 1914, *I. B. Pole Evans*, 8764; Bloemfontein, 11690; Garstfontein, Pretoria, Dec. 1911, *P. J. Pienaar*, 1969; Pretoria, March 1921, *E. M. Doidge*, 14481; in red sand under *Acacia* trees, Mauritzfontein, Kimberley, *J. P. H. Acocks* 403, 28638.

The distinguishing features of this species are the tubular mouth, light coloured endoperidium and verrucose spores.

It is uncertain whether collection No. 28638 (Plate LXVIII) is *Tulostoma albicans* or not. It agrees in essentials with the description of this species as given by White (l.c.) and Cunningham (l.c.) but differs from illustrations in various respects. In size it varies from 0.7 to 3 cm. wide and 0.6 to 1.7 cm. high; the exoperidium is brittle, comparatively thick, shell-like and quite distinct from the endoperidium, thickly encrusted with closely adhering sand and breaks up into sections which fall away from the upper part of the endoperidium, leaving a thick, sand-encrusted cup-like structure at the base. The endoperidium is very white and finely furfuraceous at first, becoming pale greyish to pale ochraceous and quite smooth. The mouth is tubular, slightly elevated, round to oval, with a slightly irregular margin. The stalk is 2.7 mm. thick, 4–6 cm. long, dirty white to pale ochraceous, sulcate-striate, somewhat scaly and has a well-developed mycelial bulb at the base. Its characteristic features are the nearly white, pubescent endoperidium, which becomes pale grey or pale ochraceous and very smooth, and the shell-like, sand encrusted exoperidium.

5. *Tulostoma bonianum* Patouillard, [Plate LXVII, fig. 3.]

Bulletin Soci  t   Mycologique de France 8 (1892) 49.

Sacc. Syll. Fung. 11 (1895) 159; Lloyd, Myc. Writ. 2, Tylostomeae (1906) 14, Pl. 76.

Peridium 7–12 mm. wide, 5–8 mm. high, depressed globose or pulvinate, sometimes with an irregular crown of membranaceous scales at the base. *Exoperidium* dark reddish or umber brown, usually consisting of minute, brown, granular warts, which are persistent for some time, then fall away entirely or in irregular patches from the upper part, but persist at the base as an irregular cup-shaped disc. *Endoperidium* pale reddish or greyish brown or pinkish buff, usually finely areolate or reticulated where the exoperidial granules have fallen off. *Mouths* round, tubular, elevated, often surrounded by a pale zone, originally covered by the granular exoperidium. *Stalk* 1–6.5 cm. long, 1–3 mm. thick, slightly thinner at the apex and with a well developed mycelial pad at the base, medium to dark reddish brown, fistulose, striate, smooth or somewhat scaly. *Capillitium* threads hyaline or tinted, sometimes brown, branched, sparsely septate, somewhat swollen at septa, varying in thickness up to usually not more than diameter of spores. *Spores* globose or subglobose to angular, finely echinulate, 4.5–6 μ diam.

Habitat: often in large clusters in ground under bushes.

Distribution: South Africa; China; Cuba; India.

Specimens examined: Garstfontein road, Pretoria, Dec. 1911, *P. J. Pienaar*, 1969; April 1911, *E. M. Doidge*, 1344; Feb. 1939, *E. M. Doidge & A. M. Bottomley*, 30617; Fountains, Pretoria, April 1921, *A. M. Bottomley*, 14499; March 1935, 20378; Stellenbosch, *A. V. Duthie* (E.L.S. 67).

According to Patouillard (l.c.) this species is near to *Tulostoma mammosum* and *T. exasperatum*, differing from the former in the exoperidium and from the latter in the mouth and spore characters. In the specimens listed above, the mouth differs from that of *T. mammosum* in being paler instead of darker than the surrounding endoperidium. The species is characterised by the granular exoperidium, the protruding, pale, round, tubular mouth and the finely echinulate spores.

6. *Tulostoma brumale* Persoon.

Synopsis Methodica Fungorum (1801) 139.

G. H. Cunningham, Gastero. (1944) 184.

Tulostoma mammosum Fr., Syst. Myc. 3 (1829) 42; Lloyd, Myc. Writ. 2, Tulostomeae (1906) 16; Verwoerd, Ann. Univ. Stell. 3 (1925) 12.

Tulasnodea leprosa Kalchbr. ex Thuem. Grev. 4 (1875) 74.

Tylostoma leprosum Kalchbr. ex Cooke, Grev. 11 (1882) 59.

T. pedunculatum (L.) Schroet. in Cohn's Beitr. Biol. Pflanz. 3 (1887) 65.

T. pygmaeum Lloyd, Myc. Writ. 2, Tylostomeae (1906) 16.

T. rufum Lloyd, l.c., p. 18.

T. floridanum Lloyd, l.c.

T. simulans Lloyd, l.c.

Peridium globose to depressed globose, 6–12 mm. diam. *Exoperidium* dark brown, usually disappearing from most of the upper part, irregularly persistent at the base. *Endoperidium* pale tan or bay brown, smooth, membranaceous. *Mouth* 1–1.5 mm., shortly tubular, round, margin more or less entire, typically darker than the rest of the peridium, but sometimes concolorous. *Stem* 2–4 cm. long, 2–4 mm. thick, chestnut brown or umber, more or less equal except for small, basal, mycelial bulb, fistulose, coarsely striate, somewhat lacerate. *Gleba* rusty brown. *Capillitium* threads hyaline to tinted, branched, septate, septa usually moderately swollen and slightly darkened. *Spores* globose or subglobose, ochraceous brown, 4–6 μ diam., strongly but usually sparsely echinulate.

Habitat : on sandy ground.

Distribution : South Africa; North America; Australia; Britain; Europe.

Specimens examined : Boschberg Mts., Somerset East, 1876, *MacOwan* 1205 as *T. squamosum*, 20928, as *T. mammosum*, 20946; in old flower tins, Knysna, *A. V. Duthie* 147. 31371.

Specimens not seen : nr. Koega Rivier, *Zeyher* 123; Stellenbosch, *Verwoerd* (Stell. 43 v. d. Byl 2033); Kentani, *Pegler* 753.

This species is characterised by the smooth, pale tan endoperidium, the raised, shortly tubular and usually darker mouth and the echinulate spores. *MacOwan's* specimen has the typical dark mouth, septate capillitium and small size of *T. brumale*.

Verwoerd, l.c., describes the spores as relatively smooth, but in specimens examined by me they appear to be sparsely but strongly echinulate.

7. *Tulostoma squamosum* (Gmelin) Persoon.

Synopsis Fungorum (1801) 139.

Hollós, Gastero. Ung. (1904) 42, 148; Lloyd, Myc. Writ. 2, Tylostomeae (1906) 14.

Tylostoma imbricatum Pers., Tent. dispos. (1797) 6.

ad *Tulostoma mammosum* (Mich.) synonym, Winter, Die Pilze 1 (1883) 892.

ad *Tylostoma mammosum* (Mich.) variet., Sacc. Syll. Fung. 7 (1888) 61.

Tulostoma pedunculatum Linn. var. *β longipes* Czern., Bull. Soc. Imp. nat. de Moscou 18 (1845) 145.

Tylostoma Barlae Quélet, Bull. Ass. France, p. 17.

Tulostoma mammosum Fr. var. *squamosum* (Gmel. ex Pers.) Fr., Sacc. Syll. Fung. 7 (1888) 61.

Peridium 6–8 mm., dark reddish brown, depressed globose. *Exoperidium* dark, rough, sometimes separating entirely from the endoperidium. *Endoperidium* smooth, thin, tough, membranaceous, pale or leather yellow. *Mouth* small, tubular, round, same colour as remainder of endoperidium or sometimes paler. *Stalk* long, round, dark, covered with large reddish-brown scales which are often caducous. *Gleba* rusty brown. *Capillitium* hyaline, strongly branched, very thick-walled, frequently septate, swollen at septa (sec. Lloyd l.c.), not septate (sec. Hollós l.c.), 4–8 μ diam. *Spores* pale yellow, verrucose, 5–6 μ diam. (Description ex Lloyd and Hollós.)

Habitat : on ground.

Distribution : South Africa ; Europe.

Specimen examined : Queenstown, C.F., Feb. 1931, *F. B. Pope* (N. J. G. Smith's collections and Kew).

Specimen not seen : "Karoo, nr. Melkriver, Somerset West, Cape", *MacOwan*, Kew (as *T. mammosum* var. *squamosum*).

The Queenstown specimen was identified, while at Kew, by N. J. G. Smith, who based his findings mainly on descriptions given by Lloyd (l.c.) and Hollós (l.c.). Prof. Smith kindly supplied the author with a specimen, remarking that it probably did not show all its original features. His notes on the collection are to the effect that in some specimens the peridia are very bleached and that in some stems the scales are rubbed off, but in specimens where these are present, the stems are very scaly. The details of the specimen examined are as follows : *Peridium* 8 mm. diam. *Endoperidium* bleached, with fragments of umber-coloured exoperidium present, especially in the basal region. *Mouth* shortly tubular, even. *Stalk* 15 × 1.5 mm., slightly bulbous, brown, irregularly sulcate, scales lacking. *Capillitium* threads frequently branched, often with an expanded area at the point of junction, occasionally septate, swollen and deeper coloured at the septa. *Spores* globose, fairly strongly verrucose, 4–6.8 μ diam. The specimen, as it is at present, shows a strong resemblance to specimens here identified as *T. albicans*.

In connection with the MacOwan specimen at Kew, "Somerset West" is evidently an error ; there is a Melk Rivier in the Karroo in the Graaff Reinet district.

The distinguishing feature of this species is the very scaly stalk. Since the scales, however, are easily rubbed off, the identification of an old specimen might easily present difficulties.

8. *Tulostoma lacticeps* Bresadola.

Annales Mycologici 18 (1920) 54.

Sacc. Syll. Fung. 23 (1925) 591.

Exoperidium furfuraceous above, soon deciduous, persistent at the tomentose membranaceous base. *Endoperidium* smooth, subglobose, papyraceous, milky white, 1–1.5 cm. diam. *Mouth* mammosc, white, not coloured, about 1 mm. high. *Stalk* hollow, pale or bright straw-coloured, covered with broad scales formed by the split epidermis, subequal, slightly compressed, the apex inserted into the depression of the peridium, 3–4 cm. long, about 4 mm. thick. *Spores* globose or subglobose, yellow, verrucose or shortly

verrucose or shortly aculeate, $4.5-5.5 \mu$ diam. or $6 \times 5 \mu$. *Capillitium* threads hyaline, thickly or somewhat thickly tunicated, septate, often thickened at the septa, $2-6 \mu$ (Bresadola l.c.).

Habitat : on ground.

Distribution : South Africa.

South African Record : Mocambique, *Torrend* 420.

Bresadola observes that this species is near *Tulostoma Molleriani*, but is well distinguished by the white colour of the endoperidium, the more coarsely verrucose spores and the straighter hyphae of the gleba.

9. *Tulostoma cyclophorum* Lloyd, [Plate LXVI, fig. 2.]

Mycological Writings 2, Tylostomeae (1906) 25, plate 85.

Sacc. Syll. Fung. 21 (1912) 476; Verwoerd, Ann. Univ. Stell. 3 (1925) 13; van der Byl, Trans. Roy. Soc. S. Africa 9 (1921) 185.

Peridium depressed globose, 6-20 mm. wide, 7-12 mm. high, with a basal crown of brown, pointed, membranaceous scales. *Exoperidium* pale brown, or darker due to the presence of sand particles, thin, brittle, disappearing almost entirely except for a shallow, disc-like structure at the base of the endoperidium. *Endoperidium* pale ochraceous to buff (Pinkish Buff to Cinnamon Buff) obscurely furfuraceous, becoming nearly smooth. *Mouth* round or more often elliptical, raised, shield-shaped, with a lacerated fibrillose or woolly margin, which is sometimes outlined by a groove. *Stem* 1-4.5 cm. long, 2-4.6 mm. thick, fistulose, slender, dark, more or less equal except for the basal mycelial bulb; the cortex splitting longitudinally into strips, but persisting around the base of the endoperidium as a lacerated collar of brown, membranaceous, pointed scales. *Gleba* rusty brown. *Capillitium* threads closely interwoven, hyaline, tinted, pale brown or occasionally dark brown, varying in thickness from very slender to 12μ diam., rather freely branched, sparsely septate, often dark and swollen to almost bulbous at the straight or oblique septa; sometimes very thick-walled. *Spores* globose or subglobose, finely verrucose, pale or yellowish brown, $3.4-5 \mu$.

Habitat : in sandy ground.

Distribution : South Africa.

Specimens examined : Grahamstown, March 1931, *N. J. G. Smith*, 25898, Kew; Matatiele, C.P., Oct. 1933, *Gideon Joubert*, 27290; Stellenbosch, May 1923, *F. Eyles* (Stell. 78; v. d. Byl 1136; Lloyd Myc. Coll. 28934, 28958); Knysna, *A. V. Duthie* 57, 58, 146, 157, 31322 (v. d. Byl 1085), 31323, 31370, 31376 (Lloyd Myc. Coll. 4494, 14279, 14280, 24519, 24520, 30832, 54734); Stellenbosch, *A. V. Duthie* (E. L. Stephens 73).

Specimens not seen : Wellington, *B. Stoneman* (Lloyd Myc. Coll. 4495, Type); locality, unknown, *P. v. d. Byl* (Lloyd Myc. Coll. 28934, 28958); *C. A. O'Connor* (Lloyd Myc. Coll. 30933); *E. L. Stephens* 220.

According to Lloyd (l.c.) this plant resembles *Tulostoma Rickii* in general appearance and particularly the cortical collar at the base of the peridium. It is distinguished from other species by its mouth, the cortical collar and the capillitium threads.

10. *Tulostoma transvaalii* Lloyd, [Plate LXVII, fig. 2.]

Mycological Writings 6, Myc. Notes 65 (1921) 1047, Plate 179, fig. 1940.

Verwoerd, Ann. Univ. Stell. 3 (1925) 13.

Peridium depressed globose to pulvinate, 0.5-1.7 cm. high, 0.8-2.4 cm. wide. *Exoperidium* umber, apically finely warted, falling away in patches from the upper part,

but persistent in the basal half. *Endoperidium* buff to light tan, pubescent then smooth. *Mouth* round to elliptic, more or less a torn aperture, indefinite to shortly mammosse with a fimbriate margin, concolorous. *Stem* 0.8–1.5 cm. long, 2–8 mm. thick, with an abrupt mycelial bulb at the base, typically short and proportionally thick, umber brown, scaly. *Gleba* ferruginous. *Capillitium* threads hyaline to tinted, up to thicker than spores but often thinner, sparsely septate and branched. *Spores* globose, brown, strongly aculeate, 6–7 μ .

Habitat : in sandy soil.

Distribution : South Africa.

Specimens examined : one collection only of ten specimens, Warmbaths, Transvaal, Feb. 1917, V. A. Putterill (Lloyd Myc. Coll. 22713, Type) 11692.

This species is characterised by its obese appearance, brown, warty exoperidium and short, mammosse mouth with fimbriate border.

11. *Tulostoma obesum* Cooke et Ellis.

Grevillea 6 (1878) 82.

G. H. Cunningham, *Gastero.* (1944) 186; Lloyd, *Myc. Writ.* 2, *Tylostomeae* (1906) 23.

Tylostoma poculatum White, *Bull. Torrey Bot. Club* 28 (1901) 431.

T. gracile White, l.c., p. 430.

T. kansense Peck ex White l.c.

T. Lloydii Bres., *Ann. Myc.* 2 (1904) 423.

Peridium depressed globose, to 10 mm. tall, 12 mm. diam. *Exoperidium* thin and fragile, breaking away completely save at the persistent basal portion. *Endoperidium* fawn coloured or dingy white, papyraceous. *Mouth* papillate, surrounded by an orbicular, fibrillose zone which may attain a diameter of 3 mm. *Stem* 2–3 cm. long, 3–5 mm. thick, tan coloured, sulcate, striate, equal, stuffed, slightly bulbous at the base. *Gleba* ferruginous. *Capillitium* threads tinted or hyaline, sparingly branched, slightly swollen at the septa. *Spores* globose or subglobose, frequently subangular, 4–6 μ diam., briefly pedicelled, epispore pallid, ferruginous, 1 μ thick, smooth. (Description after Cunningham l.c.)

Habitat : on soil.

Distribution : South Africa; North America; Australia; New Zealand.

South African Record : The Point, Knysna, C.P., A. V. Duthie 25. det. Lloyd as *T. poculatum* White.

This specimen was not included amongst others donated by Dr. Duthie to the National Herbarium, nor is it amongst van der Byl's collections.

According to Cunningham (l.c.) the distinguishing features of this species are the fimbriate mouth and smooth spores.

Cunningham, following Lloyd, originally called this species *T. poculatum* (*Gastero.*, 1925 : 254) but Coker and Couch (*Gastero.*, 1928 : 155) subsequently pointed out that the latter cannot be separated from *T. obesum* which antedates it. If, however, this species is the same as *T. volvulatum*, as Hollós seems to think, then the latter is the earlier name. Coker and Couch and Lloyd, however, treat them as two separate species, on the grounds

that in *T. volvulatum* the edge of the mouth is not composed of a fibrous wall, while in *T. obesum* it is surrounded by a slightly elevated fibrous mat. No named plants of any of these species have been available for examination.

12. *Tulostoma MacOwani* Bresadola.

Petri in *Annales Mycologici* 2 (1904) 429, Plate 6, figs. 13-14.

Sacc. *Syll. Fung.* 21 (1912) 475.

Peridium globose, papyraceous, smooth, surrounded by a dark tomentose zone at the base, deeply umbilicate, 1-1.5 cm. diam. *Mouth* fimbriate, plane. *Stalk* sub-woody, hollow, longitudinally sulcate-striate, brown, more or less smooth, scarcely lacerated, 1.5-4 cm. long, 2-3 mm. thick. *Spores* subglobose, often irregular, golden yellow, minutely and sparsely verrucose, 5.5-7 μ diam. or 5-7 \times 4-5 μ . *Capillitium* threads tinted yellow, slightly tunicated, not easily breaking into sections, 5-7 μ thick, thickened and ochraceous at the extremities. (ex *Annales Mycologici*, l.c.)

Habitat : on ground.

Distribution : South Africa.

South African Record : Cape Province, MacOwan, Kew.

The type specimen has not been seen by the writer. According to Petri (l.c.) *Tulostoma MacOwani* resembles *T. fimbriatum* Fr. in outward appearance, but the capillitium threads are like those of *T. granulosum* Lév.

13. *Tulostoma australianum* Lloyd, [Plate LXVII, fig. 1.]

Mycological Writings 2, *Tylostomeae* (1906) 20.

G. H. Cunningham, *Gastero.* (1944) 189.

Peridium 11-13 mm. wide, 5-8 mm. high, depressed globose. *Exoperidium* rough, mixed with sand particles, falling off irregularly from the upper part, usually persistent at base. *Endoperidium* whitish, smooth, tough, membranous. *Mouth* an irregular torn aperture. *Stalk* fistulose, dark or pale brown, up to 3.5 cm. long and 3 mm. thick, cortex splitting irregularly, giving stem a somewhat scaly appearance, enlarged at base. *Gleba* rusty brown. *Capillitium* threads hyaline to tinted, thick-walled, varying in thickness up to 7 μ , rather sparingly branched, sparsely septate, somewhat swollen at septa. *Spores* globose to subglobose, relatively smooth (in lacto-phenol, finely verrucose when dry) pale to dark brown, 4-6 μ diam.

Habitat : in sandy ground.

Distribution : South Africa ; Australia.

Specimens examined : Fauresmith, O.F.S., June 1935, *M. Henrici*, 28311 ; Fort Hare, Alice, C.P., Aug. 1934, *W. H. Giffen*, 27501.

This species is recognised by its irregular, torn mouth and relatively smooth spores. The description given agrees with that of Cunningham (l.c.) in the large size of the spores and scaly appearance of stem, but with that of Lloyd (l.c.) in the shorter stem and relatively smooth spores. No named specimens of the species were available for comparison and as the description was made from comparatively few individuals, it may have to be emended later.

Cunningham (l.c.) considers that *Tulostoma Readeri* and *T. granulosum* are synonyms of *T. australianum* but as, according to Lloyd, both of these apparently have strongly

verrucose spores, they are probably not the same as the South African plant, which has comparatively smooth spores; smooth in lacto-phenol but finely and sparsely verrucose when examined dry.

14. **Tulostoma adherens** Lloyd.

Mycological Writings 7 (1923) 1199, Pl. 245, fig. 2457.

Peridium 2.2–2.8 cm. wide, 1.5–2 cm. high, depressed globose, with an irregular, substantial collar at the base. *Exoperidium* dark grey to blackish, mixed with sand, falling off either in small irregular fragments or almost entirely from the upper part, persistent at base. *Endoperidium* dirty white, smooth or patchy due to dark scattered remnants of the exoperidium. *Mouth* round to elliptical, almost plane, entire. *Stalk* fistulose, tough, sulcate-striate, becoming lacerated, dingy white or pale ochraceous, with a mycelial bulb at the base. *Gleba* rusty brown. *Capillitium* threads hyaline or tinted, very variable in thickness, from 1–8.5 μ diam., straight or wavy, thick threads often irregularly thickened, sparingly branched, very sparsely septate. *Spores* ochraceous, finely but sparsely echinulate, globose or subglobose, 4–6.8 μ diam., common size about 5 μ .

Habitat: in sandy soil.

Distribution: South Africa; Australia.

Specimens examined: Stellenbosch Flats, June 1928, A. V. Duthie (E. L. Stephens 66) 31505.

In view of the fact that the above collection consists of only three specimens and these do not agree with any of the very few named specimens available, great difficulty has been experienced in placing them. Until further specimens are collected and facilities are available for comparison with overseas specimens, it has been decided tentatively to refer the South African plants to *Tulostoma adherens*, with the description of which it seems most closely to agree. The distinguishing features of the plants in question are the relatively large size, the nearly plane mouth and, in two specimens, the irregularly adhering exoperidium. It differs from descriptions of *T. adherens* in having a pale instead of a brown peridium and in its larger size.

Doubtful Species.

Tulostoma angolense Welwitsch et Currey.

Transactions Linnean Society 26 (1868) 290, Pl. 20, f. 10–11.

Sacc. Syll. Fung. 7 (1888) 64.

Entire plant 4–4.5 cm. high. *Peridium* white, subglobose. *Mouth* imperfect. *Stipe* narrowing gradually from the apex towards the base. *Capillitium* ferruginous. *Spores* concolorous, subglobose or subelliptic, 5 μ diam. (Description ex Saccardo, l.c.)

Habitat: on sandy soil and on wood.

Distribution: South Africa.

South African Records: on sand hills covered with *Euphorbia bellica* Hiern, nr. Mosamedes, Angola, Welwitsch 147; on decaying wood, S. Africa, MacOwan, Kew.

With regard to the Angola specimen, the authors (l.c.) observe that this species is possibly not distinct from *Tulostoma Meyenianum* Klotzsch [synonym of *Chlamydopus Meyenianus* (Kl.) Lloyd] but is much smaller than that species, and differs in not having the longitudinal furrows on the stem.

2. **BATARREA** Persoon.

Synopsis Methodica Fungorum (1801) 129.

Dendromyces Libr., Besch. neu entd. Polzes (1814) fig. 1.

Sphaericeps Welw. & Curr., Trans. Linn. Soc. 26 (1870) 290.

Type species: *Batarrea phalloides* (Dicks.) Pers.

Plants originally globose or pyriform, enclosed in a volva, developing in much the same way as a phalloid, finally emerging as a stalked, campanulate peridium with the remains of the volva surrounding the base of the stem. Peridium of two layers:—the exoperidium consisting of the remains of the volva, thin and usually mixed with sand particles and the endoperidium hemispherical, with a concave or almost plane base, smooth, thin, coriaceous, whitish to ochraceous, dehiscing circumscissilely, except in *B. Diqueti*, at the junction of the base with the hemispherical upper portion, the latter resembling a cap as it falls off in one piece. Stalk usually long, squamose, seated in a coriaceous to woody volva. Gleba rusty brown, compact then pulverulent, often completely disintegrating and falling away from the base of the endoperidium. Capillitium threads of two types—simple hyaline threads occurring singly or longitudinally compacted together into a hyaline sheet of tissue, and elaters or annulated cells with annular or spiral thickenings. Spores globose and, with ordinary high power magnification, seemingly thick-walled and finely verrucose. “Basidia bearing apically 1-4 spores on long sterigmata.”

According to Maublanc and Malençon (Bull. Soc. Myc. France 46, 1930 : 53), the spores are double-walled, the outer wall 0.5 μ thick, coloured and punctiform, the inner hyaline and 1 μ thick when mature, the verrucose appearance being due to thickenings caused by the intersection of the arms of the mesh surrounding the perforations.

All *Batarrea* plants are originally subterranean, usually occurring in sand or sandy soil, becoming at least partially aerial when mature. The campanulate shape of the peridium, the circumscissile dehiscence, the elaters and the nature of the spore wall are the characteristic features of the genus. According to Cunningham (Gastero. 1944 : 192) only three of the fifteen described species can be recognised with certainty—*B. Stevenii*, *B. Diqueti* and *B. phalloides*. Of these the first two occur in South Africa; *B. phalloides* has been recorded, but no young specimens of this plant have been available for study.

The spelling of the name of the genus has undergone many changes. Persoon originally named the fungus after Antonio Battarra, spelling it *Batarrea*. Since then it has been spelled in various ways by different mycologists: *Battarea* by Beauvais, *Battarraea* by Maublanc and Malençon and Cunningham and *Battarrea* by Saccardo, Fischer, Lloyd, Coker and Couch and Rea. Fries used the latter spelling in the first place, but later reverted to Persoon's spelling, which is used here.

Key to the species.

- | | |
|--|--------------------------|
| Volva gelatinous; plants comparatively small..... | 1. B. phalloides. |
| Volva not gelatinous; plants larger. | |
| Endoperidium caducous, dehiscing circumscissilely..... | 2. B. Stevenii. |
| Endoperidium persistent, dehiscing by apertures..... | 3. B. Diqueti. |

1. **Batarrea phalloides** (Dickson) Persoon.

Synopsis Methodica Fungorum (1801) 129.

Berkeley, Hooker's London Journ. Bot. 2 (1843) 517.

Sacc. Syll. Fung. 7 (1888) 66; Rea, Brit. Basid. (1922) 53; Hollós, Gastero. Ung. (1904) 38; Verwoerd, Ann. Univ. Stell. 3 (1925) 13.

Peridium campanulate, with hemispherical upper portion and concave to almost plane base, up to 3.5 cm. diam. *Exoperidium* whitish, represented by the remains of the volva

left when the latter splits to release the developing stalked peridium. *Endoperidium* enclosing the gleba, membranaceous, becoming tough and coriaceous, splitting circumscissilely at the junction of the upper hemispherical portion with the concave base, the former falling off in one piece like a cap or calyptra. *Stalk* 0.5–1 cm. thick, 14–19 cm. long, rusty brown, attenuated at both ends, woody; cortex splitting into linear, membranaceous scales, which are often pendulous in the upper part and erect in the lower. *Stalk* hollow, or stuffed when mature with long silky threads, filled when immature with mucilaginous substance, seated in the base of the remains of the volva. *Volva* white, two-layered, originally soft, with mucilaginous substance between the two layers, becoming tough and hard. *Gleba* rusty brown. *Capillitium* threads of two kinds, simple hyaline threads occurring singly or longitudinally compacted together into a shred-like tissue, and annulated threads or elaters with annular or spiral thickenings, $62-80 \times 8 \mu$. Spores ochraceous brown, obtusely verrucose, globose, often with a hyaline apiculus, 6μ diam.

Habitat : in sandy places and in vegetable debris.

Distribution : ? South Africa; North and South America; Asia; Australia; Europe.

South African Records : on ground, Uitenhage, C.P., Zeyher 114; on humus ground, Kalk Bay, C.P., M. Levyns (v. d. Byl, 1305, det. v. d. Byl).

Batarrea phalloides is distinguished from other species mainly on the nature of the volva, which is gelatinous in young plants, whereas in other species it is originally fleshy, never gelatinous. Neither of the two South African collections has been seen. Zeyher's specimen is probably in the Herb. Berkeley at Kew; Mrs. Levyns' specimens were not found amongst v. d. Byl's collections.

Hollós considers that *B. phalloides* is the only recognisable species, but Cunningham is followed in separating *B. Stevenii* and *B. Diqueti* for reasons indicated later. Verwoerd (l.c.) makes no mention of the nature of the volva in his description. He probably based his identification on the interpretation of Hollós, in which case the Levyns' specimen may quite likely be *B. Stevenii*.

2. *Batarrea Stevenii* (Liboschitz) Fries, [Plate LXIX; LXX, fig 2.]

Systema Mycologicum 3 (1829) 7.

Sacc. Syll. Fung. 7 (1888) 66; G. H. Cunningham, Gastero. (1944) 192.

Dendromyces Stevenii Lob., Besch. neu entd. Pilzes (1814).

Batarrea gaudichaudii Mont., Ann. Sci. Nat. Ser. II, 2 (1834) 76.

Sphaericeps lignipes Welw. et Curr., Trans. Linn. Soc. 26 (1870) 290.

Battarrea guicciardiniana Ces., Atti d. R. Accad. Sci. e Nat. 7 (1875) 1.

B. Muelleri Kalchbr. ex. Kalchbr. & Cooke, Grev. 9 (1880) 3.

B. tepperiana Ludw., Bot. Centralbl., 43 (1890) 7.

B. luciniata Underw., ex. White, Bull. Torrey Bot. Club 28 (1901) 439.

? *B. levispora* Mass., Kew Bull. (1901) 152; Sacc. Syll. Fung. 7 (1888) 24.

Peridium campanulate, with pulvinate upper portion and concave base, 2.4–7 cm. wide, 2–5 cm. high. *Eroperidium* whitish, fragile, soon disappearing. *Endoperidium* smooth, glossy, rough, membranaceous, white or ochraceous, dehiscing by circumscissile rupture at the junction of the upper part with the concave base, the former falling off in one piece resembling a cap, leaving the mass of the gleba attached to the concave base, which is cream, greyish or buff-coloured, thin, woody, entire or lacerated around the edge, shining and smooth underneath and shallowly rugulose above. *Stalk* 11–40 cm. long, 0.7–3 cm. thick, dove grey, ochraceous to drab, cylindrical or oval, attenuated towards the base,

fibrous woody, hollow, deeply sulcate, moderately to strongly squamulose, due to the longitudinal splitting of the cortex into thin to broad, linear, membranous scales, which may be either erect or pendulous; seated in a non-gelatinous, irregularly split volva. Volva up to 8 cm. wide and high, of three layers—the outer whitish, coriaceous woody and rough with sand particles, the middle layer rusty brown and spongy fibrous and the inner ochraceous, woody, surrounding the base of the stem-like a sheath. Gleba rusty brown, (Verona Brown), greyish brown, at first compact, later pulverulent and disintegrating, leaving the base of the endoperidium completely bare. Capillitium originally attached to all parts of the endoperidium, of two types—simple, hyaline threads occurring singly or as shreds, and thicker, hyaline elaters, which are cylindrical or fusiform, simple or less frequently once forked, straight, wavy or angled, with darker annular or spiral thickenings. Spores globose, subglobose or slightly irregular, thick-walled, seemingly finely verrucose, 4.5–7 μ diam.

Habitat : solitary or very occasionally caespitose, usually occurring in sand or sandy soil in exposed or shaded positions.

Distribution : South Africa; North and South America; Asia; Australia; Europe.

Specimens examined : Kaapmuiden, Tvl., H. A. Wager, 7735; Koffiefontein, O.F.S., March 1916, Schulz, 9535; Rouxville, June 1917, J. Wickens, 11294; Postmasburg, Jan. 1920, M. Wilman, 12517; ? Willowmore, C.P., Dec. 1919, Dr. Schonland, 12518; Malcomess, Knapdaar, C.P., April 1924, Gideon Joubert, 18112; in sand dunes in scrub, Lourenco Marques, Moçambique, J. van Nieuhuys, 25936; in deep sand under Acacias, Saltpan, N. Tvl., H. Schweickhardt, 26622; on turf, Sekukuni, Lydenburg Distr., May 1935, W. G. Barnard 391, 28517; 372, 28261 (said to be medicinal, native name MOKOTATMPJA); on dry black vleis soil, Fauresmith, O.F.S., March 1936, J. Pont, 28584; Knysna, April 1939, A. M. Bottomley 30743; Knysna, Jan. 1920, A. V. Duthie 134, 31362, as *B. phalloides*; sand dunes, Pringle's Bay, Dec. 1935, R. H. Compton (E. L. Stephens 461); Bantry Bay, V. A. Putterill, 28669; foothills of Langebergen, Riversdale, C.P., May 1927, R. Marloth, 13437, as *Tylostoma*.

Specimens not seen : on banks of Caroca River nr. Cabo Negro, Mossamedes, Welwitsch 150, as *Sphaericeps lignipes* Welw. et Curr.

The South African plants assigned to this species are of two more or less distinct types—a slender, grey, small-headed plant of the *Batarrea tepperiana* type, in which the gleba completely disintegrates and falls away and in which the volva is consistently lacking, and a larger, more robust type with large volva present, longer elaters and somewhat larger spores, and in which, in all specimens seen, the gleba remains compact if somewhat pulverulent for a considerable time after the endoperidium has fallen off. Unfortunately the volva, on the nature of which *B. Stevenii* is separated from *B. phalloides*, is lacking in every specimen of the smaller type, so that it is impossible to be absolutely sure that these plants are not *B. phalloides*; but since the latter species is said to be known with certainty only from Britain and France, such plants are referred to *B. Stevenii* until such time as complete young specimens are found.

3. *Batarrea Digueti* Patouillard et Hariot, [Plate LXX, fig. 1.]

Journal de Botanique 10 (1896) 251, tab. 2.

Sacc. Syll. Fung. 14 (1899) 259; White, Tylostomaceae, Bull. Torrey Bot. Club 28 (1901) 440; Lloyd, Myc. Writ. 2, Tylostomaceae (1906) 7, Pl. 75.

Battarrea Griffithsii Underwood, White l.c.

Peridium 2–3.5 cm. wide, 1–2 cm. high, pulvinate, with a concave base centrally seated on the slightly enlarged apex of the stem, the junction between the upper rounded portion

and the concave base clearly demarcated by a narrow, protruding, membranaceous margin. *Exoperidium* thin, chalky, brittle, white, more or less smooth, mainly persistent on the upper part. *Endoperidium* whitish to pale buff, very smooth, like kid to the touch, not dehiscing circumscissilely, like other species, at the junction of the upper and lower parts, but probably by several irregular, scattered apertures which develop at maturity. *Stalk* whitish or cream, 15-20 cm. long, 8-10 mm. thick, cylindrical, hollow, deeply sulcate, attenuated towards the base, almost smooth or squamose, with linear, obscurely imbricate scales, concolorous, seated in a volva. *Volva* of three layers, the outer coriaceous, rigid, the middle composed of 10-20 membranaceous, fibrous, brownish layers and the inner 1-1.5 mm. thick, woody, closely surrounding the stem like a sheath at about a third of its height. *Gleba* rusty brown, pulverulent. *Capillitium* of two types, simple, hyaline threads of varying thickness from filiform to 7 μ diam., occurring either singly or longitudinally compacted together to form a shred-like tissue, and coarser, hyaline elaters up to 136 μ long and 3.4-7 μ diam., simple or forked, wavy, nearly straight or angled and with darker annular or spiral thickenings. *Spores* globose, broadly oval, usually thick-walled, obscurely verrucose (cf. remarks on genus) ochraceous brown, sometimes shortly pedicelled, 4-6.8 μ . (Description ex Patouillard et Hariot, l.c.)

Habitat : in "barren, rocky soil" and on termite mounds.

Distribution : South Africa ; North America.

Specimens examined : on termite heap, Dongola Reserve nr. Messina, N. Tvl., Aug. 1925, I. B. Pole Evans, 20459.

This specimen has a peridium 3 cm. wide, 2 cm. high and a stipe (broken off) 11 cm. long, 9 mm. thick, deeply sulcate and only slightly lacerated here and there.

The species is distinguished by its persistent endoperidium and non-circumscissile dehiscence. It is thought to dehisce by apertures which develop late, but it is possible that the indications of apertures, seen in the South African specimen, may be the beginning of general disintegration.

According to Cunningham (Gastero. 1944 : 192) *B. Diguetti* is confined to North America, but there seems little doubt that the South African plant here described in this species.

3. PHELLORINA Berkeley.

London Journal of Botany 2 (1843) 421.

emended Kalchbrenner & Cooke, Grev. 9 (1880) 3.

Sacc. Syll. Fung. 7 (1888) 145 ; G. H. Cunningham, Gastero. (1944) 193 ;
Verwoerd, Ann. Univ. Stell. 3 (1925) 14.

Xylopodium Mont., Ann. Sci. Nat. ser. III, 4 (1845) 364.

Areolaria Kalchbr., Ertek. Term. 8 (1884) 8.

Cypellomyces Speg., Anal. Mus. nac. Beunos Aires 9 (1906) 25.

Type Species : *Phellorina inquinans* Berk.

Plants white when fresh, consisting of a stalked peridium in which the exoperidium and the endoperidium are continuous with the outer layers of the stalk. Exoperidium typically covered with scales or warts. Endoperidium a thin, tough, membranous structure, dehiscing by the disintegration and falling away of the apical part of the peridium ; the lower part persistent as a cup-shaped structure. Stalk thick, woolly, typically squamose. Gleba

finally rusty brown, becoming pulverulent and falling away. Capillitium threads hyaline, shred-like. Spores globose, pale ochraceous, finely verrucose. Basidia arranged in persistent fascicles, each basidium bearing 1-4 spores, which are sessile on short sterigmata.

According to Cunningham, the genus has probably only four species, *Phellorina inquinans*, *P. strobilina*, *P. macrospora* Lloyd and *P. argentensis* (Speg.) Fr. Of these only the first two are found in South Africa. *P. macrospora* is confined to North America and *P. argentensis* to South America.

Key to the South African Species.

Exoperidium covered with flat, overlapping scales.....	<i>P. inquinans</i>.
Exoperidium covered with zoned pyramidal warts.....	<i>P. strobilina</i>.

1. *Phellorina inquinans* Berkeley, [Plate LXXI.]

London Journal of Botany 2 (1843) 421.

Sacc. Syll. Fung. 7 (1888) 145 ; Verwoerd, Ann. Univ. Stell. 3 (1925) 14 ; G. H. Cunningham, Gastero. (1944) 193.

Xylopodium Delastrei Mont., Ann. Sci. Nat. Ser. III, 4 (1845) 366.

X. australe Berk., Journ. Linn. Soc. 13 (1872) 171.

X. Aitchisonii Cooke et Mass. ex Cooke, Grev. 16 (1887) 69.

Phellorina californica Peck, 42nd Rep. New York State Mus. (1890) 35.

P. Saharæ Pat., Bull. Soc. Myc. France 12 (1896) 151.

P. Delastrei (Mont.) Fisch., Nat. Pflanz. 1, 1** (1900) 334.

P. australis (Berk.) Lloyd, Myc. Writ. I, Lyc. Austr. (1905) 11.

? *Xylopodium bonaciniae* Speg.

? *Phellorina leptoderma* Pat.

Plants 8-23 cm. high. *Peridium* pyriform, 4-9 cm. high, 5-9 cm. wide. *Exoperidium* cream to pale ochraceous, continuous with the stalk, in typical plants covered with large, coriaceous, downward overlapping scales. *Endoperidium* becoming membranous, smooth, shining, whitish to leaden coloured, subglobose to oval, continuous with the stem, dehiscing by the irregular breaking away of the apical portion, or by splitting circumscissilely above the middle ; the upper part then disintegrating and falling away, leaving a stalked, cupulate structure with a lacerated margin, exposing the gleba. *Stalk* 5-14 cm. long, 1.5-2.7 cm. thick, whitish, cream or becoming pale brown on exposure, almost smooth, longitudinally striate, with few to many large, erect scales at intervals or overlapping one another, solid, slightly tapering towards the base which may or may not be bulbous. *Gleba* cream to ochraceous, becoming cinnamon to rusty brown (Ochraceous Tawny), compact at first, becoming pulverulent. *Capillitium* threads scanty, more in the nature of hyaline shreds than individual threads. *Spores* globose to subglobose, pale yellowish brown, finely verrucose, 4.5-8.5 μ diam.

Habitat : usually in sandy soil, solitary.

Distribution : South and North Africa ; North America ; Asia ; Australia.

Specimens examined : Knapdaar, Burgersdorp Distr., 1918, Gideon Joubert, 11541 ; April 1924, 18111 ; Nov. 1935, 28519 ; Nov. 1936, 28739 ; Springbok Flats, Tvl., May 1912, Rev. N. Roberts, 2277 ; Kroonstad, O.F.S., Sept. 1929, J. W. Pont, 24934 ; Winburg, O.F.S., May 1941, E. Haslem, 33272 ; Kingwillamstown, C.P., June 1932, F. M. Leighton, 26409 ; Barkly West Distr., C.P., May 1936, J. P. H. Acocks 335, 28633 ; Clanwilliam, A. V. Duthie 203, 31398.

Specimens not seen : Uitenhage, Zeyher 98, Type ; Vaal River, Kimberley, Pearson Kew.

Typical specimens of this species are recognised by the pyriform peridium covered with large, smooth, flat, downward overlapping scales. In less typical plants (Nos. 24934, 18111, 11541, 2277) the peridium is more or less areolated with flat wart-like thickenings between the divisions. This form is transitional between *P. inquinans* and *P. strobilina*.

2. *Phellorina strobilina* Kalchbrenner, [Plate LXXII.]

ex Kalchbrenner & Cooke, Grevillea 9 (1880) 4.

Sacc. Syll. Fung. 17 (1905) 239 ; Verwoerd, Ann. Univ. Stell. 3 (1925) 14.

G. H. Cunningham, Gastero. (1944) 194.

Scleroderma strobilina Kalchbr. ex Thuem., Grev. 4 (1875) 74.

Phellorina squamosa Kalchbr. et MacOwan in Kalchbrenner, Grev. 10 (1882) 109.

Areolaria strobilina Kalchbr., Erték. Term. 8 (1884) 8.

Xylopodium ochroleucum Cooke et Massee ex Cooke, Grev. 15 (1887) 95.

Plants 6·5–15 cm. high. *Peridium* 3·5–6 cm. high, 2·5–7·5 cm. wide, depressed globose or less often subglobose. *Eroperidium* pure white at first, becoming dirty white, pale ochraceous or pale brown, covered with zoned, usually angular, pyramidal warts which are up to 1·5 cm. high and 2·5 cm. broad at the more or less angular, expanded base. *Endoperidium* whitish to leaden coloured, tough, membranaceous, smooth, shining. *Stalk* 5–12 × 1–2 cm., white, cream, ochraceous, thick, solid, woody ; smooth, deeply striate-sulcate or sparsely or thickly covered with large erect scales ; straight, curved or crooked, equal or attenuated towards the base, bulbous or not. *Gleba* finally rusty brown, compact, becoming pulverulent and falling away. *Capillitium* threads scanty, hyaline, shred-like. *Spores* globose, finely verrucose, pale ochraceous brown, 4·5–7 μ , average size rather smaller than in *P. inquinans*.

Habitat : sand, sandy soil, heavy black turf ; solitary or occasionally caespitose.

Distribution : South Africa ; Australia ; India.

Specimens examined : Rust der Winter nr. Warmbaths, Tvl., 1936, *I. B. Pole Evans*, 28645 ; Saltpan, nr. Louis Trichardt, Tvl., April 1934, *I. C. Verdoorn & H. Schweickerdt*, 27546 ; on hard red clay, Limpopo, Tvl., July 1926, *I. B. Pole Evans*, 21019 ; Brits, Tvl., April 1925, *E. Marais*, 20409 ; Glen, O.F.S., April 1921, *T. Potgieter*, 14506 ; July 1935, *J. Sellschop*, 28270 ; on cattle manure, Kroonstad, O.F.S., *J. W. Pont*, May 1929, 25342 ; Brandfort, O.F.S., April 1921, *Dr. Schonken*, 31468 ; Fauresmith, O.F.S., March 1939, *L. C. C. Liebenberg*, 33250 ; Knapdaar, Burghersdorp, C.P., April 1924, *Gideon Joubert*, 18110, 1914, 11814 ; May 1916, 9735 ; April 1919, 11854 ; Aliwal North, C.P., April 1917, *J. Wickens*, 10137 ; Uitenhage, *MacOwan 1095* (S.A.M. 35081) 20919 ; locality unknown, *R. Marloth*, 26620 ; Little Namaqualand, *J. P. Stokoe*, 26619 ; Winburg, O.F.S., April 1924, *M. Radloff* (v. d. Byl 1440) ; Willowmore, May 1928, *Dr. H. Brauns* (v. d. Byl 2508) ; on heavy black turf, Warmbaths, Tvl., summer 1937, *Rowland*, 28808 ; Calvinia, C.P., May 1937, *A. A. Schmidt*, 28809 ; Winburg, O.F.S., May 1941, *E. Haslem*, 33271, 33461 ; Bon Accord Dam, Pretoria Distr., April 1930, *A. Leemann*, 25434 ; Clanwilliam, C.P., *Miss Berg*, 31304 (Duthie 26) ; Fauresmith, O.F.S., *M. Henrici*, 35276.

Specimens not seen : Brandfort, O.F.S., *Duthie 300* ; S. Rhodesia, *Duthie* ; Bloemfontein, *L. Verwoerd* ; Southern Rhodesia, *Duthie 189* (Herb. Bulawayo Mus.).

This species is probably more common in South Africa than *Phellorina inquinans*. It is distinguished from the latter by the more globose shape of the peridium and particularly

by the large, projecting, zoned, pyramidal warts of the peridium. Ex description, Cunningham (l.c.) considered that *Phellorina squamosa* Kalchbr. & MacOwan is probably *P. inquinans*. The type collection of *P. squamosa*, MacOwan 1095, is definitely *P. strobilina* and not *P. inquinans* as suggested by Cunningham.

4. CLAMYDOPUS Spegazzini.

Anales del Museo nacional de Buenos Aires 6 (1899) 189.

Type species: *Chlamydompus Meyenianus* (Klotzsch) Lloyd.

Plants consisting of a 2-layered peridium attached to the enlarged apex of a well-developed stem. Exoperidium rough, brittle, breaking up into fragments which fall away. Endoperidium smooth, thin, tough, membranaceous, dehiscing by an irregular apical aperture. Stem solid, enlarged at the apex, slightly attenuated towards the base and seated in a small cupulate volva. Gleba ochraceous brown, pulverulent. Capillitium threads copious, sparingly branched, sparsely septate. Spores globose, ochraceous, finely verrucose. Basidia fasciculate, bearing at the apex 1-4 spores with short sterigmata.

This genus is sometimes confused with *Tylostoma*, which it superficially resembles, but from which it differs in the attachment of the stalk to the peridium and in having persistent, fasciculate basidia. It resembles *Phellorina* in having fasciculate basidia mixed with the capillitium threads, but differs in the stalk attachment and in dehiscence by a definite apical aperture.

Chlamydompus Meyenianus (Klotzsch) Lloyd, [Plate LXXIII.]

Mycological Writings 1, Myc. Notes 14 (1903) 131.

G. H. Cunningham, Gastero. (1944) 195.

Tylostoma Meyenianum Klotzsch, Noc. Act. Caes. Leop. Carol. Nat. Cur. 19 (1843) 243

T. maxima Cooke et Massee ex Cooke, Grev. 15 (1887) 94.

Chlamydompus clavatus Speg., Anal. Mus. nac. Buenos Aires 6 (1899); Succ. Syll Fung. 16 (1902) 234.

C. amblaiensis Speg. l.c.

Peridium pulvinate to depressed globose, 3.5-4.2 cm. wide, 2.5-3 cm. high. *Exoperidium* dirty white to buff, rough, shell-like, brittle, breaking up into fragments which fall away entirely or leave remnants at the line of juncture with the apex of the stem. *Endoperidium* smooth, greyish white to buff, tough, membranaceous, dehiscing by a torn apical aperture, base attached to the enlarged apex of the stem. *Stalk* 8.5-12 × 1-2 cm., woody, more or less solid, concolorous with the peridium, broadly sulcate, especially in the upper part; the cortex, especially in the lower part, splitting into rings of small, scale-like fragments; expanding towards the apex, but slightly constricted where attached to the peridium, narrowing towards the base, seated in a volva. *Volva* 2-layered, cupulate, 1.5 cm. wide, 2 cm. high (in the only specimen in which the volva is present). *Gleba* ochraceous brown, pulverulent. *Capillitium* threads hyaline to ochraceous, sparingly branched, sparsely septate, varying in thickness up to 7 μ diam. *Spores* 5.2-7 μ diam., finely verrucose, pale ochraceous, attached to the fascicles of basidia.

Habitat: in sandy soil.

Distribution: North and South Africa; North and South America; Australia.

Specimens examined : one collection of three specimens, details of locality and collector missing, 35339.

The distinguishing features of this plant are the persistent fascicles of basidia, the volva at the base of the stem, the dehiscence of the peridium by an apical aperture and the expanded apex of the stem.

5. **DICTYOCEPHALOS** Underwood.

Bulletin of the Torrey Botanical Club 28 (1901) 441.

Battareopsis P. Henn., Hedwigia Beibl. 41 (1902) 212.

Whetstonia Lloyd, Myc. Writ. 2 (1906) 259.

Type species : *Batarrea attenuata* Peck.

Sporophore hypogeous, enclosed in a volva during early stages of growth, erumpent as maturity approaches ; stipitate, stem stout, solid, becoming woody ; peridium of two layers, outer (exoperidium) roughened, inner (endoperidium) coriaceous to membranaceous, seated on the expanded discoid apex of the stipe ; dehiscence by the irregular breaking away of the peridium ; gleba powdery, having permanent cells and persistent fascicles of basidia, true capillitium none ; spores globose to subglobose, fulvous, verrucose.

Dictyocephalos attenuatus (Peck) Long & Plunkett.

Mycologia 32 (1940) 697.

Batarrea attenuata Peck, Bull. Torrey Bot. Club 22 (1895) 208.

Dictyocephalos curvatus Underwood, Bull. Torrey Bot. Club 28 (1901) 441.

Battareopsis Artini P. Henn., Hedw. Beibl. 41 (1902) 212.

Whetstonia strobiliformis Lloyd, Myc. Writ. 2 (1906) 259.

Phellorina strobilina as shown by Lloyd, Myc. Writ. 5 (1917) 735 (see. Long and Plunkett, l.c.).

“*Sporophore* 7–56 cm. tall, originating 4 to 20 cm. below the surface of the soil, often with 1–2 white cord-like roots ; *Sporocarp* globose to subglobose, depressed, often irregular, 2–6 cm. high by 5–13 cm. broad, seated on the discoid apex of the stipe, basal portion hard, thick, with the narrow margin usually concave beneath ; the *discoid apex*, when freed from the gleba, light tan to white, convex and coarsely reticulate by the boundary walls of broad shallow pits ; *exoperidium* fleshy to gelatinous when young, developing horny to subcartilagenous scales with age which may be small and more or less persistent or large 4–5 sided pyramidal warts 1–2 cm. broad by 1–1.5 cm. tall, normally deciduous leaving a decided scar on the endoperidium ; *endoperidium* 1–2 mm. thick, basal portion often coriaceous and persistent, upper part membranous, brittle when dessicated, dehiscing by breaking into irregular pieces which soon fall away leaving the gleba exposed ; *stipe* curved, sometimes straight, 5–52 cm. tall, 2–5 cm. thick at the top, 1–4 cm. at bottom, solid (except where hollowed out by insects) terete or flattened, often deeply sulcate, usually attenuate below, subfleshy, dry, subcoriaceous to woody, context when young white, becoming Walnut Brown to Vandyke Brown with age, outer surface uneven and peeling, often with coarse, spreading or reflexed scales caused by the outer layers of the stipe cracking both transversely and longitudinally from weathering, base of stipe often pointed and becoming entirely free from the enclosing volva ; volva persistent, usually cupulate to obconic, sometimes tubular,

lacinate-incised, 3-11 cm. tall by 4-8 cm. wide at top, walls 2-4 mm. thick, rupturing from 2-8 cm. below surface of soil, thereby exposing the ascending sporocarp to the dirt for this distance during elongation, walls apparently composed of three layers, inner layer a thin tissue which deliquesces into a blackish fluid just preceding and during elongation, median layer semigelatinous when young, becoming horny with age, outer layer white to tan, hard, chalky in texture; *gleba* foetid, with odour of decaying fish, Pecan Brown to Mikado Brown (after Ridgway), cellular, cell wall white, fragile, membranous, composed of a hyaline amorphous central tissue overlaid by a dense network of branching colourless to fulvous hyphae, easily fragmenting and falling away in lacinate irregular flakes and shreds, cell walls in bottom of the gleba thicker, firmer and more permanent, often persisting as broad, flattened, pointed teeth on the exposed convex surface of the glebal floor long after the gleba has disappeared; *capillitium*, free capillitium absent, but the hyphae composing the outer layers of the glebal cell walls may break loose and simulate capillitial threads; *spores* globose to subglobose, 5-7 μ , walls thin, fulvous, verrucose; *basidia* clustered, bearing 1-4 spores on the short sterigmata." (Description ex Long & Plunkett l.c.)

Habitat : " Growing solitary or in groups of 2-5 individuals in sandy or adobe alkaline soil, in arid or semi-arid regions. "

Distribution : North and South Africa, North America.

South African record : Wankie District, Southern Rhodesia, 1916, *Albert Giese*. One specimen only, half of which is in the Lloyd Mycological Collection, Washington DC. under the name *Phellorina strobilina* and the other half in the National Museum of Southern Rhodesia at Bulawayo under the same name.

Through the courtesy of the Director of the National Museum of Southern Rhodesia, the specimen quoted above was sent to me for examination. This consists of rather less than half the plant, from which the very pulverulent gleba has become detached, with about two inches of stem. No volva is present. A comparison between this specimen and specimens of the South African plant called *Phellorina strobilina* showed no difference apart from the shape of the stem apex. In the former this is more or less flattened while in the latter it is narrowly concave, the margin widening out and continuing upwards in the shape of a wine glass to form the exo- and endo- peridium. In both cases the exoperidium is continuous with the stem which is the character on which *Phellorina* is distinguished from *Dictyocephalos*. Judging therefore from the specimens examined by me, *Phellorina strobilina* as shown by Lloyd l.c., is not, as stated by Long and Plunkett l.c., considered to be a *Dictyocephalos* but a *Phellorina*.

PODAXIS Desvaux.

Journal de Botanique 2 (1809) 87.

Morse, Mycologia 25 (1933) 1; Ed. Fischer in Nat. Pflanz. Band 7a (1933) 116; G. H. Cunningham, Gastero. (1944).

Schweinitzia Grev. Edinburgh Phil. Journ. 8 (1823) 257.

Cauloglossum Grev., Scottish Crypt. Fl. 1 (1823) 60.

Podaxon Fr., Syst. Myc. 3 (1829) 62.

Chainoderma Mass. ex Cooke, Grev. 19 (1890) 46.

Type species : *Podaxis pistillaris* (Linn. ex Pers.) Morse.

Plants consisting of a stalked peridium in which the stalk is prolonged to the apex of the peridium as a columella. Exoperidium smooth and polished or originally scaly.

Endoperidium comparatively thick, firm, compact, brittle, typically dehiscing at the basal margin of the peridium by splitting away from the stem, less often by longitudinal splitting of the endoperidium or by the entire peridium falling off and exposing the stipe with gleba attached. Stalk usually bulbous at the base. Gleba copious. Capillitium threads sparingly branched, sparsely septate, tinted to dark coloured, straight, wavy or spiral. Spores usually broadly oval, double-walled. Basidia in fascicles.

The characteristic features of the genus are the percurrent stem, the fasciculate basidia and the double-walled spores. It is most closely related to *Phellorina* from which it differs in having the stem prolonged as a columella to the apex of the peridium.

Podaxon is the name more commonly known for this genus, but *Podaxis* was the name originally given by Desvaux and according to the International Rules of Botanical Nomenclature, must take precedence. Morse (l.c.) and Cunningham are followed in recognising one species only in this genus. Some 32 different species have been described at various times, but Miss Morse, who has studied the plant very extensively, is unable to find any specific differences between them.

Podaxis pistillaris (Linnaeus ex Persoon) Morse, [Plate LXXIV ; LXXV ; LXXXVI.]

Mycologia 25 (1933) 27.

G. H. Cunningham, Gastero. (1944) 197.

Scleroderma pistillare (L.) Pers., Syn. Meth. Fung. (1801) 150.

S. carcinomale (L.) Pers., l.c., p. 153.

Podaxis senegalensis Desv., Journ. de Bot. 2 (1809) 97.

Podaxon indicus Spreng., Syst. Veg. 5 (1828) 518.

P. carcinomalis (L. ex Pers.) Fr., Syst. Meth. Myc. 3 (1829) 62.

P. calyptratus Fr., l.c.

P. pistillaris (l. ex Pers.) Fr., l.c., p. 63 ; Sacc. Syll. Fung. 7 (1888).

P. aegypticus Mont., Ann. Sci. Nat. Ser. II, 20 (1843) 69.

P. loandensis Welw. et Curr., Trans. Linn. Soc. 26 (1850) 288.

P. elatus Welw. et Curr., l.c.

P. mossamadensis Welw. et Curr., l.c. ; Sacc. Syll. Fung. 11 (1895) 158.

P. arabicus Pat., Bull. Soc. Myc. Fr. 3 (1887) 122.

Podaxis arata (Bosc.) Mass., Journ. Bot. 28 (1890) 75.

P. Farlowii Mass., l.c., p. 77.

P. emerici Berk. ex Mass., l.c., p. 77.

Chainoderma Drummondii Mass. ex Cooke, Grev. 19 (1890) 46.

Podaxon Schweinfurthii Pat., Bull. Soc. Myc. Fr., 6 (1890) 165.

P. Deflersii Pat., l.c.

P. squamosus Pat., Bull. Soc. Myc. Fr., 7 (1891) 210.

P. mexicanum Ellis, Journ. Myc. 7 (1893) 274.

P. Perraldieri Pat., Cat. Pl. Cell. Tunisae (1897) 68.

P. Glaziovii P. Henn., Hedwigia 36 (1897) 210.

P. ghattasensis P. Henn., Ibid. 37 (1898) 287.

P. Gollanii P. Henn., Ibid., 40 (1901) 338.

P. algericus Pat., Bull. Soc. Myc. Fr. 20 (1904) 53.

P. Muelleri P. Henn., Hedwigia 43 (1904) 187.

P. macrosporus Speg., Anal. Mus. nac. Buenos Aires 16 (1906) 27.

P. termitophilus Jun. et Perr., Compt. Rend. 145 (1907) 274.

P. anomalum Lloyd., Myc. Writ. 6, Myc. Notes 64 (1920) 992.

Podaxis carcinomalis (Linn. ex Pers.) Dodge, Compt. Morph. Fungi (1928) 495.

Plants up to 32 cm. tall, hypogaeous at first, later developing above ground. *Peridium* usually long in proportion to the stipe, 2–15 cm. long, 1.3–8.5 cm. diam., long cone-shaped or oblong oval, with or without a blunt apex. *Exoperidium* smooth or covered with pendant, scattered or imbricate scales, which usually fall off. *Endoperidium* whitish-grey when young, later pale grey ochraceous, pale greyish brown, ochraceous brown or umber, more or less smooth, firm, compact, brittle, up to 4 mm. thick; typical dehiscence by the separation of the lower edge from the stem, followed by longitudinal splitting of the liberated margin; less frequently the whole endoperidium falls off, exposing the columella with closely attached mass of greenish brown gleba. *Stipe* 3–13 cm. long, 2–4 cm. thick, longitudinally striate to sulcate, often with pendant, imbricate scales caused by horizontal splitting due to rapid growth; stipe straight or bent, prolonged to the apex of the peridium as a columella, enlarged at the base to form a bulbous or tuberous structure composed of hyphae mixed with soil. *Gleba* copious, compact, finally olivaceous, reddish brown or almost black. *Capillitium* threads tinted to olivaceous or olivaceous-brown, varying in thickness, 3.4–19 μ , thin- or thick-walled, walls sometimes with spiral thickenings, straight, wavy or loosely spiral, sparingly branched, very sparsely septate. *Spores* 5–17 \times 4–11.9 μ , olivaceous brown to dark reddish brown, usually broadly oval, occasionally subglobose, sub-kidney-shaped, pyriform or irregular, often truncated, obscurely asperulate, sessile or attached by very short pedicels to basidia arranged in semi-persistent fascicles.

Habitat: most commonly on termite heaps, also in sandy or clayey soils; solitary or in groups.

Distribution: North, Central and South Africa; North and South America; Australia; India.

Specimens examined: on termite heaps, Pretoria, Feb. 1911, *I. B. Pole Evans*, 1186; Jan. 1929, *V. A. Wager*, 23672; Nov. 1933, *H. Schweickerdt*, 27280; Pretoria–Johannesburg road, *L. J. Kresfelder*, 26602; Garstfontein, Pretoria, April 1911, *P. J. Pienaar*, 1689; Feb. 1912, *I. B. Pole Evans*, 2120; Skinner's Court, Pretoria, Feb. 1912, *I. B. Pole Evans*, 2119; Hennops River, Pretoria, April 1912, *I. B. Pole Evans*, 5125, 20660; Impati Hills, Dundee, Natal, Dec. 1913, *E. M. Doidge*, 7362; Eshowe, Zululand, Feb. 1930, *C. J. Howlett*, 25361; Estcourt, Natal, April 1938, *O. West* 29955; *K. A. Lansdell*, 30714; Potchefstroom, July 1943, *J. Sellschop*, 34405; Kimberley, C.P., Feb. 1934, *Mrs. Broom*, 27369; July 1923, *N. Radloff* (v. d. Byl 1183); Hopetown–De Aar road, C.P., March 1933, *H. Schweickerdt*, 26690; Bloemfontein, 1878, *Exton* (P. MacOwan 1362; S.A.M. 34317) 22070; Knapdaar, C.P., March 1921, *Gideon Joubert*, 14507, April 1924, 18109; 25 miles north of Dordrecht on road to Aliwal North, Jan. 1946, *R. A. Dyer* 4736, 35425; Welgevonden, Tvl., Dec. 1934, *A. O. D. Mogg*, 28254; between Koelenhof and Mulders Vlei, C.P., April 1935, *J. Acocks* (E. L. Stephens 414); Somerset West Flats, April 1940, *S. Garside* (E. L. Stephens 507); Orange Free State, *P. v. d. Byl* 2802; Greenside Mission, Bizana Distr. Pondoland, April 1935, *E. Schaefer*, 28260; locality unknown (E. L. Stephens 399); ex Herb. Marlothiana, 26591 as *Phellorina Delastrei*; on hard red ground, between Windsorton and Klipdam, Barkly West, C.P., June 1936, *J. P. H. Acocks* 406, 28641; on sandy soil, Sand River Drift, Messina, Nov. 1916, *I. B. Pole Evans*, 9789; on ground, Hammanskraal, Tvl., Feb. 1921, *M. R. H. Thompson*, 14484; Brits, March 1931, *J. W. Pont*, 25915; on (?) Pietersburg, Nov. 1912, *Rev. N. Roberts*, 5182; Kroonstad, Dec. 1912,

P. v. d. Byl, 5585; Klapmuts, C.P., 1934, *J. P. H. Acocks* (E. L. Stephens 400); Postmasburg, *E. Esterhuysen*, April 1940 (E. L. Stephens 509); South-West Africa, *Hilmar Luckhoff* (E. L. Stephens 399).

Specimens not seen: Gansekraal, *Thunberg*; without locality, *Burchell*; Uitenhage, *Zeyher* 99, Kew, Inanda, *Medley Wood* 405, Kew; "between Omtendo and Omsamculo" *Drège* 9454 a & c, 4115, Kew, *Drège* 9454 d, Paris; Stellenbosch, *Krige* (Duthie 283 a); Karroo, *Duthie* 24; Boroma, *Menyharth*; Olukonda, Amboland, *Schinz*; between Lopollo and Monimo, Huilla, *Welwitsch* 148; on banks of river Maiomba, Mossamedes, *Welwitsch* 149; southern Great Namaland, *Schultze*.

The distinguishing features of this species are the percurrent, columella-like stem, the typical basal dehiscence of the peridium by separation from the stem, the fasciculate basidia and the double-walled spores.

Podaxis pistillaris is the plant commonly known in South Africa as *Podaxon carcinomalis*. It is widespread in distribution but sporadic in appearance, occurring chiefly on termite heaps singly or less often in groups. Single specimens often resemble a snake's head at a distance. Plants growing on termite heaps are usually of a much larger type than those occurring on the ground, so much so, that the latter have often been considered as a separate species. The plant is very variable, not only in size but in external appearance, size and shape of spore and in capillitium characters.

NIDULARIALES.

Growing on ground, wood, dead vegetable matter such as old sacks, coir matting, etc., and on dung.

Peridium sessile, small, cup-shaped, campanulate, goblet-shaped or subglobose, the mouth in two genera covered over until maturity by a membranaceous structure—the epiphragm; dehiscing either in an irregular manner by the breaking of the wall or by the rupture of the epiphragm. Peridioles one to many, globose or lenticular, usually black, with or without a thin, veil-like, superficial tissue, the tunica, embedded in mucilage in the peridium or attached to its inner wall by means of elastic threads—the funiculi. Basidia bearing 4-8 sessile or shortly sterigmate spores. Spores smooth, hyaline, globose or broadly oval. Capillitium absent.

There are only two families in this order—NIDULARIACEAE and SPHAEROBOLACEAE, both of which are represented in South Africa.

NIDULARIACEAE Fries.

Systema Mycologicum 2 (1822) 296.

Peridium small, cup-shaped, campanulate or subglobose, 1-3 layered, enclosing a number of peridioles and dehiscing by the rupture of an apical membranaceous epiphragm, or breaking up irregularly. Peridioles lenticular, smooth, attached to the inner wall of the peridium at different levels by white, cord-like, elastic funiculi or embedded in mucilage; consisting of a horny, dark-coloured wall enclosing the basidia and spores. Basidia clavate, bearing 4-8, usually 4, smooth, sessile or stipitate, apical or scattered spores. Spores smooth, hyaline, broadly oval, globose or subglobose.

The members of this family are popularly known as "Birds'-Nest fungi" owing to the resemblance of the peridioles to eggs in a nest. Of the four genera belonging to the family, only two—*Crucibulum* and *Cyathus* are represented in South Africa.

Key to the Genera.

Peridioles attached to the cups by funiculi.

Peridium cup-shaped, with an epiphragm.

Wall of peridium without a middle pseudoparenchymatous layer. Peridioles covered by a thick, white, tunica. Spores not mixed with threads..... 1. **Crucibulum.**

Wall of peridium with a middle pseudoparenchymatous layer. Tunica thin or absent. Spores mixed with threads..... 2. **Cyathus.**

Peridioles without funiculi.

Peridium cup-shaped, with an epiphragm..... (*Nidula*.)

Peridium subglobose, without a typical epiphragm..... (*Nidularia*.)

1. CRUCIBULUM Tulasne.

Annales des Sciences Naturelles, Sér. 3, I (1844) 89.

Type species: *Crucibulum vulgare* Tul.

Peridium cup-shaped or bell-shaped, sessile; wall composed of a single thick layer, which is originally densely tomentose on the outside, becoming almost smooth with age

Inside of cup smooth, without striae and covered with a thin, silvery lining. Apex covered by a thin, floccose epiphragm, which soon disappears. Peridioles numerous, filling the cup, attached to the wall by means of simple, inconspicuous funiculi; covered with a thick, whitish, conspicuous tunica; the wall consisting of three layers, an outer thin layer of dark, interwoven filamentous cells, a middle one of dark, branched hyphae and an inner layer of hyaline hyphae.

This genus is represented by one species only, which is world-wide in distribution. It is recognised by the single peridium, the presence of an epiphragm and the attachment of the peridioles to the inner wall by means of funiculi.

Crucibulum vulgare Tulasne, [Plate LXXVII, fig. 1.]

Annales des Sciences Naturelles, 3 Sér. I (1844) 90.

Sacc. Syll. Fung. 7 (1888) 43; Lloyd, Myc. Writ. 2, Nidulariaceae (1906) 13

Verwoerd, Ann. Univ. Stell. 3 (1925) 38; G. H. Cunningham, Gastero. (1944) 203.

Cyathus crucibulum Pers., Syn. Meth. Fung. (1801) 238.

Nidularia crucibulum (Pers.) Fr., Syst. Myc. 2 (1822) 299.

N. juglandicola Schw., Trans. Am. Phil. Soc. 4 (1834) 253.

Cyathus finicola Berk., Journ. Linn. Soc. 18 (1881) 387.

C. pezizoides Berk. l.c.

C. pusio Berk. l.c.

Crucibulum juglandicolum (Schw.) de Toni in Sacc. Syll. Fung. 7 (1888) 44.

C. simile Mass., Grev. 19 (1891) 94.

C. crucibuliforme (Scop.) White, Bull. Torrey Bot. Club 20 (1902) 269.

C. levis (DC.) Kambly, Univ. Iowa Studies 17 (1936) 167.

Peridium 3-6 mm. high, 3-8 mm. wide at apex, cupulate, slightly attenuated towards the sessile broad base, attached to the substratum by means of a light brown to tawny felt-like pad, straight or slightly flared. *Outer surface* tawny ochraceous, densely tomentose, becoming greyish brown and almost smooth with age. *Inner surface* dingy brown or whitish with a silvery lining which often finally disappears; margin even, thick; epiphragm a thin, loosely woven tissue of two layers, the outer thin, floccose and of the same colour as the outer surface, the inner very thin, fragile, veil-like, both soon disappearing. *Peridioles* 2-2.8 mm., numerous (16 counted) filling the cup, the outlines often visible through the epiphragm; attached to the wall by means of very thin, inconspicuous funiculi, consisting of fascicles of long, thin, occasionally branched hyphae with thickened joints; embedded in mucilage; smooth, round lenticular, slightly depressed at the umbilici from which the funiculi arise, black but appearing greyish white or pale brownish due to the presence of a thickish tunica. *Spores* oval, hyaline, smooth, $7.5-10 \times 4-5 \mu$ diam.

Habitat: on decaying wood, twigs and other vegetable matter, gregarious.

Distribution: Cosmopolitan.

Specimens examined: Papegaaisberg, Stellenbosch, July 1925, *J. de Vos*, 31495; *Miss Loseby* (v. d. Byl 2671).

Specimens not seen: Stellenbosch, *L. Verwoerd* (Stell. 352).

2. **CYATHUS** Haller ex Persoon.

Synopsis Methodica Fungorum (1801) 236.

v. Haller, Historia stirpium Helvetiae 3 (1768) 127.

Fungoides Vaillant, Bot. Paris, Leidae et Amsterdam (1727) 57.

Cyathoides Micheli, Nova plantarum genera (1729) 222.

- *Cyathia* P. Browne, Civ. & Nat. Hist. Jamaica (1756) 78; White in Bull. Torrey Bot. Club 29 (1902) 255.

Type species: *Cyathus olla* Pers.

Peridium sessile or substipitate, obovate or fusoid, becoming goblet-shaped or inverted bell-shaped, mouth at first closed by a whitish, grey or yellowish, membranaceous epiphragm, which ruptures and disappears at maturity; wall composed of three layers—a central pseudoparenchymatous layer between two layers of loosely woven filaments. Peridioles lenticular, compressed, umbilicate, 10–18 in number, attached to the wall of the cup by a conspicuous, white, complex, cord-like funiculus, black or dark brown, but colour often partly obscured by the presence of a thin, whitish tunica. Spores hyaline, smooth, elliptical or subglobose. Coker and Couch (Gastero. 1928) describe the internal structure of the peridioles as follows: “Basidia not forming a distinct or homogeneous hymenium, but scattered at irregular heights throughout a large central area and intermingled with numerous delicate threads which at maturity have their cell walls greatly thickened and gelatinised to form a solid, horny matrix, throughout which the spores are unevenly scattered. At the time the spores are growing, this matrix is not horny but gelatinous, becoming horny at maturity . . . The hyaline, sclerotic layer, composing the greater part of the wall, is composed of crumpled and distorted cell units with very thick walls. In *Cyathus* these units do not separate when crushed but break up into irregular masses and bits of cells; in *Crucibulum* they separate in great part when crushed.” Basidia 2–4 spored. Spores smooth, hyaline, broadly elliptical, obovate or subglobose, intermixed at maturity with thick, horny filaments.

Habitat: Usually gregarious, on wood, soil, decayed vegetable matter and dung.

Distribution: cosmopolitan.

The genus *Cyathus* is recognised by the three-layered peridial wall, the well-defined epiphragm and the complex, cord-like funiculi.

Key to the South African Species.

Inner surface of peridial cup without grooves or striae.

Spores less than 15 μ long.

Peridioles 1–1.5 mm. diam.

Spores up to 10 μ long 1. **C. dasypus.**

Spores up to 4 μ long 2. **C. minutosporus.**

Peridioles 1.5–2 mm. diam.

Spores usually broadly elliptic; cups tapering towards base . . . 3. **C. pallidus.**

Spores usually more or less globose; cups abruptly narrowed towards base 4. **C. microsporus.**

Peridioles 2–2.5 mm. diam., margin of cup usually straight 5. **C. Hookeri.**

Peridioles 2–3.5 mm. diam., margin of cup usually flared 6. **C. olla.**

Spores 15–30 μ long, sub-globose 7. **C. stercoreus**

Inner surface of peridial cup striate or sulcate.

Spores large, 15–44 μ long 8. **C. Poeppigii.**

Spores medium, 10–20 μ long, egg-shaped 9. **C. Montagnei.**

Spores small, 7–10 μ long, sub-globose 10. **C. Berkeleyanus**

1. *Cyathus dasypus* Nees.

Horae physicae berolinensis (1820) t. 5, f. 1, p. 41.

Sacc. Syll. Fung. 7 (1888) 40; Verwoerd, S. Afric. Journ. Sci. 25 (1928) 238.

Nidularia dasypus Fries, Syst. Myc. 2 (1923) 299.

Peridium 5–10 mm. high, 5–7 mm. wide at the mouth, inverted cone-shaped; smooth and light coloured within, light brown and clothed with downy hairs outside. *Peridioles* 1–1.5 mm. diam., more or less round and lenticular, covered by a thin, light-coloured tunica. *Spores* more or less globose or egg-shaped, hyaline, smooth, 10×8 –10 μ . (Translated from Verwoerd l.c.)

Habitat: on manure and swampy and other ground.

Distribution: South Africa; Guadaloupe; Chile.

South African records: on ground, Caledon, C.P., Verwoerd 184; without locality, Pole Evans, det. Lloyd as “probably *C. dasypus*”; on swampy ground and manure, “Cape of Good Hope” as *Nidularia dasypus* Fr.

Lloyd originally thought that this species was a variety of *C. olla* (*vernicosus*) with irregular peridioles, but after examination of Verwoerd's collection, decided that it agreed with *Cyathus dasypus* in the original sense of Nees. It is recognised by its irregular, cinereous peridioles and the lead-coloured inner wall of the cup. The peridioles in *C. olla* are typically dark and 2–3.5 mm. in diameter.

2. *Cyathus minutosporus* Lloyd emend. Verwoerd.

Lloyd, Mycological Writings 7 (1924) 1325; Verwoerd, South African Journal of Science 25 (1928) 238.

Peridium 4–7 mm. high, 4 mm. wide at mouth, globose, sessile; outer surface moderately hairy, brown; inner surface smooth, brown. *Peridioles* 1–1.5 mm. diam., more or less spherical or lenticular, dark leaden coloured to black, with a relatively thin tunica. *Spores* usually small, egg-shaped, hyaline, smooth, 4×2 μ . (Translated from Verwoerd l.c.)

Habitat: on clayey soil.

Distribution: South Africa.

South African record: Heidelberg, Transvaal, E. Neethling (Verwoerd 330; Lloyd Myc. Coll. 24889 Type).

The small size of the spores is the distinguishing feature of this species. The material from which the above description was made is said to have been weathered and it was thus impossible definitely to establish the characters and colour of the peridium.

3. *Cyathus pallidus* Berk. et Curt., [Plate LXXVIII, 3rd row.]

Cuban Fungi 517 in Journ. Linnean Society, London, Part II, 10 (1869) 341.

Verwoerd, Ann. Univ. Stell. 3 (1925) 7; Lloyd, Nidulariaceae in Myc. Writ. 2 (1906) 22; Sacc. Syll. Fung. 7 (1888) 37.

Peridium 6–9 mm. high, 4–7 mm. wide at mouth, goblet-shaped, tapering towards a substipitate base which arises from an ochraceous, felt-like pad (very conspicuous when the substratum is wood) typically straight, occasionally slightly flared. *Outer surface* clothed with ochraceous, light brown or dove grey, erect to spreading, strigose, matted hairs, which originally cover the incurved, depressed apex and finally often project slightly

beyond the margin in a fimbriate manner. The strigose hairs may partially disappear from the upper part of the mature cup. Colour of old cup grey or brown. *Inner surface* smooth; or sometimes slightly sulcate in old specimens, silvery grey or leaden, becoming dark grey. *Peridioles* 1.5–2 mm. diam., occasionally up to 2.5 mm., at first covered with a thin, silvery tunica, which later usually disappears, exposing the blackish peridioles; attached by strong, white funiculi to the wall of the cup. *Spores* usually $6.2-10.8 \times 5.4-7.2 \mu$, sometimes larger, broadly elliptical, sometimes subglobose or obovate.

Habitat : gregarious, on dead wood, dung, soil and decayed vegetable matter.

Distribution : South Africa ; Antigua ; Cuba ; Jamaica.

Specimens examined : on dead wood, Pretoria, *D. J. Fouché*, Jan., 1922, 15649 ; *A. Hean*, Feb. 1939, 30727 ; *H. V. King*, March 1937, 28806 ; Fountains, Pretoria, March 1939, *A. Hean*, 30692 ; *B. Lourens*, 28619 ; Fairy Glen Road, Pretoria, *E. M. Doidge*, 30690 ; Garstfontein, Pretoria, *A. Hean*, 30689 ; Kromrivier nr. Buffelspoort, Marikana, Tvl., *E. M. Doidge* & *A. M. Bottomley*, 33254 ; Lemana, Spelonken, N. Tvl., Aug. 1911, *E. M. Doidge*, 1699 ; Grahamstown, *E. L. Stephens* 255, 27275 ; Kingwilliamstown, *Sister de Victoria*, July 1930, 25486 ; Knysna, *A. V. Duthie* 114, 31357 ; Woodbourne, Knysna, *A. V. Duthie* 63, 31327 ; Deepwalls, Knysna, *A. M. Bottomley*, 30772 ; Pietermaritzburg, Natal, *Rump* 65, Aug. 1934, 27681 ; *I. B. Pole Evans*, April 1911, 1340, Kew ; Mooi River, Natal, *Crass* (*Rump* 444) 28605 ; Xumeni Forest, Natal, Jan. 1935, *E. M. Doidge*, 27735 ; Hopevale, Donnybrook, Natal, Dec. 1940, *E. M. Doidge*, 33174 ; on soil, decayed vegetable matter or dung, Rietondale, Pretoria, Feb. 1936, *L. J. Kresfelder*, 28865 ; Mamagaliesskraal, Brits, Tvl., *D. J. Fouché*, Jan. 1927, 21084 ; Hopevale, Donnybrook, Natal, Dec. 1941, *E. M. Doidge*, 33257 ; Kaapmuiden, E. Tvl., April 1914, *H. A. Wager*, 7727 ; Johannesburg, Jan. 1930, *Dr. A. Porter* (v. d. Byl 2550) ; Garstfontein, Pretoria, *E. M. Doidge*, 1348, 30728 ; *E. M. Doidge* & *A. Hean*, Feb. 1943, 30693 ; Fort, Grahamstown, *N. J. G. Smith* (*E. L. Stephens* 492, *N. J. G. Smith* 20).

Specimens not seen : Somerset East, C.P., *MacOwan* ; Knysna, *Verwoerd* (*Stell.* 109) ; ? Grahamstown, *N. J. G. Smith*, Kew.

This species differs from *C. olla* in having strigose, matted hairs on the outer surface of the cup and usually smaller spores and peridioles.

4. *Cyathus microsporus* Tulasne, [Plate LXXVII, 3rd row.]

Monograph Nidulariees, Ann. sc. nat., 3 sér., I (1844) 73, f. 6 8.

Sacc. Syll. Fung. 7 (1888) 35 ; *Verwoerd*, Ann. Univ. Stell. 3 (1925) 37.

Peridium 7–8 mm. high, 6–9 mm. wide at mouth, funnel-shaped, abruptly narrowed towards the shortly stiptate base, attached to the substratum by a pale brown mycelial pad ; *outer surface* greyish-brown, striate, clothed with rough, brown, adpressed, interwoven hairs, becoming more or less smooth ; *inner surface* even, not striate. *Peridioles* 1.5–2 mm. diam., more or less globose, grey, with a thin tunica. *Spores* elliptic or obovate, smooth, hyaline, $4.4 \times 6.4 \mu$.

Habitat : dead wood.

Distribution : South Africa ; Brazil ; Haiti.

Specimens examined : Pietermaritzburg, Natal, Dec. 1915, 9205, det. Lloyd.

Specimens not seen : Knysna, *Duthie* 230, 31416 ; without locality, *Verwoerd* (*Stell.* 108) ; Stikland, *J. Acocks* (*E. L. Stephens* 465).

This species differs from *C. Berkeleyanus* in the smooth, not striate, inner surface of the cups.

The Pietermaritzburg specimen, No. 9205, was identified by Lloyd as *C. microsporus*, attention being called to the small size of the spores, which he found to measure $6-7\ \mu$. An examination of the duplicate material, however, showed spores of the sizes $6.8-11 \times 5-6.8\ \mu$. Since a smaller spore is called for, I am not satisfied that the above specimen is *C. microsporus* and have tentatively referred it to *C. olla*. Our specimen of *Duthie 230*, also identified by Lloyd, has unfortunately only the basal mycelial pads left, so no comparison is possible. Verwoerd's measurements are quoted above.

5. **Cyathus Hookeri** Berkeley, [Plate LXXVII, 2nd row.]

in Hooker's Journal of Botany 6 (1854) 204.

Sacc. Syll. Fung. 7 (1888) 35; Lloyd, Myc. Writ. 2, Nidulariaceae (1906) 28
G. H. Cunningham, Gastero. (1944) 205.

Peridium 9-10 mm. high, 5-8 mm. wide at mouth, common size 10×7 mm., long goblet-shaped, gradually attenuated towards a very thin base, attached by means of a pale brown, cushion-like pad; margin straight or slightly flared, even, finely crenulate or finely fimbriate; *outer surface* ochraceous-brown to greyish-brown, clothed with matted strigose hairs which partially disappear with age; *inner surface* smooth or sometimes obscurely sulcate, putty coloured, grey or pale brown. *Peridioles* 2-2.5 mm. diam., broadly oval, lenticular, wrinkled, black, but colour obscured by the thin, whitish tunica, which makes them appear leaden. *Spores* typically broadly oval, also subglobose and obovate, smooth, tinted yellowish, thick-walled, $6.8-11 \times 7-8\ \mu$.

Habitat: on dead wood.

Distribution: India; New Zealand; South Africa.

Specimens examined: Pretoria, Jan. 1919, *I. B. Pole Evans*, 12311, det. Lloyd; Hogsback, Alice, C.P., Dec. 1937, *K. Putterill*, 30814.

The South African plant identified by Lloyd as *C. Hookeri* is very near *C. pallidus*, from which it appears to differ only in the more slender shape, the thinner base and possibly slightly wider spores. The New Zealand plant, however, also determined by Lloyd, is near to *C. olla* (Cunningham, l.c.) being finely tomentose and bay brown in colour. Our plant seems more nearly to conform to the original description of *C. Hookeri* in having matted, strigose hairs and being pale in colour. In Lloyd's remarks about Pole Evans' collection he says "the spores are small, $6.8\ \mu$ and the species like *C. microsporus* except for the pale (not dark) cups". In the Putterill collection, the spores are rather larger, $7-11 \times 7-8\ \mu$.

The South African plant further differs from the New Zealand plant as regards the middle layer of the peridial wall, which is pseudoparenchymatous and not formed of deeply coloured, woven hyphae, as described by Cunningham.

6. **Cyathus olla** Persoon, [Plate LXXVIII, fig. 1.]

Synopsis methodica fungorum (1801) 237.

G. H. Cunningham, Gastero (1944) 206.

Cyathus vernicosus (Bull.) DC., Fl. Fr. 2 (1805) 270; Sacc. Syll. Fung. 7 (1888) 38; Verwoerd, Ann. Univ. Stell. 3 (1925) 37; Fischer, Nat. Pflanzenfam. 2 Aufl., 7 a (1933) 59.

Nidularia vernicosa Bull., Hist. Champ. Fr. 1 (1809) 164.

N. plumbea Pers., Champ. Comest. (1818) 110.

N. fascicularia Schw., Trans. Am. Phil. Soc. 4 (1834) 253.

Cyathus campanulatus Corda, Anleit. 80 (1842) 19.

C. similis Cooke, Grev. 8 (1879) 58.

Cyathus lentifera (L.) White, Bull. Torrey Bot. Club 29 (1902) 264.

Nidularia olla Link, Obs. I, Mag. Ges. nat. Freunde III (1809) 34.

Peridium 5–15 mm. high, 5–13 mm. wide at mouth, goblet- or bell-shaped, tapering to the sessile or substipitate base; mouth incurved when young, becoming typically flared, but often straight in mature specimens of the same collection, sometimes obscurely striate in old specimens; *outer surface* light brown or straw-coloured, usually becoming greyish brown, covered at first with woolly, tomentose, adpressed hairs, finally sometimes almost smooth or with scattered greyish brown hairs; *inner surface* even, smooth, leaden, greyish brown or silvery brown. *Peridioles* 2–3.5 mm. diam., usually large but very variable in size even in the same cup, lenticular, dull olive brown to blackish when old, originally pale grey when covered with a thin, whitish tunica which disappears with age; attached by strong, white, easily detachable funiculi. *Spores* 6.8 13.6 \times 5.7 μ , broadly elliptical, obovate.

Habitat: on dead wood, soil or decayed vegetable matter, during rainy season; gregarious.

Distribution: North and South Africa; North and South America; Australia; New Zealand.

Specimens examined: Fountains Valley, Pretoria, March 1918, *H. Melle*, 11328, det. Lloyd; *A. M. Bottomley*, March 1924, 18141; Wonderboom, Pretoria, March 1929, *L. Reinecke*, 23705; Pelindaba nr. Pretoria, *P. Watson*, Feb. 1930, 25157; Wellington, C.P., *A. M. Bottomley*, May 1911, 1696; Stellenbosch, *A. V. Duthie* 280, 31453, 171, 31380, 252, 31433; Knysna, *J. Phillips*, Feb. 1925, 20608; Mamathes, Basutoland, *A. Hean*, Feb. 1941, 33494; Fauresmith, O.F.S., *Botha*, May 1934, 27573; Port Elizabeth, *Director of Museum*, July 1939, 30782; Bloemfontein, *G. Potts* 7190, March 1917, 13010; Hopevale, Donnybrook, Natal, Jan. 1935, *E. M. Doidge*, 28923; Pietermaritzburg, Natal, *J. M. Sim*, Dec. 1915, 9205 det. Lloyd as *C. microsporus*; Stellenbosch, *Champion* (v. d. Byl 2044 as *C. vernicosus*); Hopefield, C.P., Oct. 1923, *v. d. Byl* 1265 as *C. vernicosus*; Lady Grey, C.P., Feb. 1925, *R. I. Nel* (v. d. Byl 2349) as *C. vernicosus*; without locality, ex Herb. Lloyd, *v. d. Byl* 1419 as *C. vernicosus*; Somerset East, 1874, *MacOwan* 1042, 20981; 1875, *MacOwan* 1042 as *Nidularia farcta* Fr. (S.A.M. 35075), 20837; Fischhoek, C.P., 1934, *V. Peers* (E. L. Stephens 397).

Specimens not seen: Bloemfontein, *Verwoerd* as *C. vernicosus*; Sea Point, Cape Town, *Duthie* 31.

The characteristic features of this species are the straw-coloured, woolly outer surface of the immature plant and the large peridioles. The spores are usually larger than those of *C. pallidus* but vary considerably in size.

7. *Cyathus stercoreus* (Schweinitz) de Toni. [Plate LXXVIII, 2nd row.]

in Saccardo's Sylloge Fungorum 7 (1888) 40.

Lloyd, Myc. Writ. 2, Nidulariaceae (1906) 19; Verwoerd, Ann. Univ. Stell. 3 (1925) 37; G. H. Cunningham, Gastero. (1944) 206.

Nidularia stercorea Schw., Trans. Am. Phil. Soc. 4 (1834) 253.

Cyathus Wrightii Berk., Grev. 2 (1873) 34.

C. Baileyi Mass., Grev. 21 (1892) 3.

C. dimorphus Cobb, Agric. Gaz. N.S.W. (1892) 1005.

- C. affinis* Pat., Bull. Soc. Myc. Fr. (1895) 87.
C. rufipes Ell. & Ev., Bull. Torrey Bot. Club 24 (1897) 125.
C. rufipes (Ell. & Ev.) White, l.c. 29 (1902) 265.
C. Wrightii (Berk.) White, l.c.
C. stercoria (Schw.) White, l.c., 266.

Peridium 3.5–8 mm. high, 3.5–6 mm. wide at mouth, urceolate or goblet-shaped, tapering towards the sessile or sub-stipitate base, which sometimes arises from a light brown, felt-like mycelial pad, especially when on wood; solitary or gregarious, often occurring in dense clusters resembling a wasp's nest; usually becoming crumpled when old; *outer surface* grey, greyish brown or ochraceous, at first hairy or almost tomentose with a light brown, felt-like covering over the depressed apex, becoming more or less smooth or sparsely strigose with age; *inner surface* smooth, leaden, then dark greyish brown or almost black; mouth smooth or fimbriate, sometimes slightly sulcate in old specimens. *Peridioles* 1.5–2.5 mm., lenticular, smooth, black with metallic sheen, without a tunica; outer wall thick, composed of coarse brown fibrils; usually attached by a funiculus, but this appears to be lacking in some cases. *Spores*, many or few, typically large, $13.6\text{--}37.4 \times 10.2\text{--}30.6 \mu$, very variable in size even in one peridiole; globose, subglobose, broadly elliptical, egg-shaped, smooth, thick-walled and granular when mature.

Habitat: usually gregarious; on dung, soil, rotten wood and other decaying vegetable matter.

Distribution: World-wide.

Specimens examined: on decaying wood, Pretoria, Feb. 1915, *Bischoff* 8817; Glen, O.F.S., April 1921, *Potgieter*, 14690; Fort Hare, Alicedale, *Giffen*, Aug. 1934, 27502; Pretoria, Jan., *M. Bosman*, 23668; Knysna, *Duthie* 311 b (E. L. Stephens 65); on manure, Potchefstroom, June 1927, *H. A. Lawrence*, 21929; Hopevale, Donnybrook, Natal, Jan., 1935, *E. M. Doidge*, 3317, 27718; *K. E. Morgan*, Feb. 1935, 28922; Fountains Valley, Pretoria, March 1936, *B. Louwrens*, 28620; Komgha, C.P., April 1936, *Cooke*, 28589; on soil, Onderstepoort nr. Pretoria, March 1924, *Dr. Curson*, 18116; Bloemfontein, March 1917, *H. G. Parkiss* (Grey Univ. Coll. Herb. 7204) 13015; Pretoria, 1907, *I. B. Pole Evans*, 1902; Pietermaritzburg, *J. M. Sim*, Feb. 1915, 8823; Kimberley, March 1915, *J. C. Moran*, 8963; Pretoria, March 1924, *C. Punt*, 18142, *Kresfelder*, Jan. 1931, 25870; Johannesburg, *Mrs. Moss*, March 1935 (T.R.L. 283) 29941; without locality, ex Farmer's Weekly, March 1929, 25316; Haenertsburg, Tvl., March 1938, *S. Thompson* (T.R.L. 282); on rotting sack, Buffelspoort, Marikana, Tvl., *F. A. S. Turner*, 30687; Hopevale, Donnybrook, Natal, Jan. 1935, *E. M. Doidge*, '44 (with *Sphaerobolus stellatus*); Pretoria, v. d. Byl 1428 det. Lloyd; Salisbury, S. Rhodesia, *Eyles* 4101 (v. d. Byl 2347, S. Rh. 161); Nardouw Pass, C.P., Aug. 1941, *P. C. de Kock* (E. L. Stephens 560).

Specimens not seen: Livingstone Is., Victoria Falls, S. Rhodesia, *Cheesman*; without locality, *R. Marloth*.

This species is characterised by its large, globose or subglobose spores, its black peridioles, often closely aggregated and crumpled appearance and the dark interior of the cups.

forma *Leseurii* Tulasne, [Plate LXXVIII, 2nd row.]

Ann. Sci. nat. 3 Sér., I (1844) 79.

Sacc. Syll. Fung. 7 (1888) 38; Lloyd, Myc. Writ. 2, Nidulariaceae (1906) 21, Plate 108, figs. 10–11; Coker & Couch, Gastero. (1928) 179.

Peridium long goblet-shaped, 10–12 mm. high, 6–7 mm. wide at the mouth, shortly stipitate, arising from a large, rufous-brown mycelial pad; *outer surface* light greyish brown,

clothed with coarse, matted, shaggy hairs, which may partially disappear in the upper part, margin even; *inner surface* smooth, silver grey, becoming dark greyish brown. *Peridioles* nearly black, resembling black lead, without a tunica, up to 2.5 mm. diam., with thick, rigid outer wall consisting of dark, reddish brown fibrils: attached or not attached by funiculi. *Spores* large, globose, subglobose, broadly elliptical, thick-walled and yellowish, granular when mature, $23.8-34 \times 23.8-27.2 \mu$.

Habitat: on manured ground and sandy soil, gregarious.

Distribution: North America; South Africa.

Specimens examined: on manured ground, Brits, Tvl., *J. v. d. Plank*, June 1942, 33503.

The above collection of seventeen individuals differs from typical *Cyathus stercoreus* mainly in shape and size of the cups. These are much longer in proportion to the width, more stipitate, lighter in colour both externally and especially internally, being greyish brown instead of nearly black inside, and do not become crumpled when old, as most of the typical plants do. The peridioles are larger and the spores more uniformly globose or subglobose. These specimens resemble Lloyd's photograph (l.c.) of material at Paris. They differ from Coker and Couch's description (l.c.) in the taller and less slender shape, the absence of hairs on the mouth and the larger size of the peridioles, but agree with their illustration (l.c. plate 123) in shape. The Australian typical plant (Cunn. l.c. plate 32) resembles the South African uncommon "forma *Leseurii*".

8. ***Cyathus Poeppigii*** Tulasne, [Plate LXXVIII, 4th row.]

Monograph Nidulariées in Ann. Sc. nat. 3 sér., I (1844) 70, t. 10, figs. 9-11.

Verwoerd, Ann. Univ. Stell. 3 (1925) 36; Sacc. Syll. Fung. 7 (1888) 37; Coker & Couch, Gastero. (1928) 177, plate 121.

Cyathus plicatulus Poepp., Hautlubens, exs. n. 47.

C. sulcatus Kalchbr., Grevillea 10 (1882) 107.

Peridium 5-10 mm. high, 4-7 mm. wide at mouth, goblet-shaped, often crumpled when old, arising from a mycelial pad, which is very conspicuous in young plants growing on wood; usually strongly sulcate, dark brown to blackish when old; *outer surface* clothed when young with dark brown, matted shaggy hairs, which later partially disappear, exposing the slightly or distinctly striate or sulcate surface; *inner surface* leaden or slate grey at first, becoming dark brown to blackish with age, shiny, striate-fluted in upper part. *Peridioles* lenticular, 1.25-2 mm. diam., black, dull at first owing to the presence of a thin, white, film-like tunica which gradually disappears, finally black-lead colour, smooth, attached by strong, white funiculi. Outer wall of peridioles thick, consisting of coarse brown fibrils. *Spores* few to many, $15.3-44 \times 10.2-23.8 \mu$, comparatively few longer than 34μ ; size very variable even in the same peridiole, subglobose, broad-elliptic or egg-shaped, sometimes depressed along the sides (for illustration of spores cf. Coker & Couch, Gastero. N. Amer., Plate 121). Van der Byl found the spores to be $36 \times 28 \mu$.

Habitat: on soil or dead and rotting wood.

Distribution: East and South Africa; North and South America; Australia Mauritius; West Indies.

Specimens examined: Pretoria, March 1921, *C. Punt*, 14500; de Beer's Rust, Pretoria, Feb. 1939, *A. Hean*, 30691; Port Durnford, Zululand, *S. S. Ballenden* (Natal Herb. 910), 32011; Inanda, Natal, *J. Medley Wood* 334 as *C. sulcatus* Kalchbr. 11186, 10454; Pietermaritzburg, *J. M. Sim*, Feb. 1915, 8803; *Rump*, Jan. 1933, 26846, *Rump* 544, 33962; Sibasa, Zoutpansberg, Feb. 1920, *Rev. Junod*, 12826; Durban, *v. d. Byl* 594, 597 det. L. Verwoerd as *C. plicatulus* in G. C. Nel, Ann. Univ. Stell. 20 (1942) 71.

9. **Cyathus Montagnei** Tulasne, [Plate LXXVII, 4th row, left.]

Monograph. Nidulariées in Annales des Sciences Naturelles, 3 Sér. I (1844) 70, t. 10, f. 9-11.

Sacc. Syll. Fung. 7 (1888) 34; Verwoerd, Ann. Univ. Stell. 3 (1925) 35.

Peridium 5-10 mm. high, 5-9 mm. wide at mouth, goblet-shaped, attached to wood by a conspicuous, ochraceous yellow mycelial cushion; *outer surface* clothed with matted, brown, strigose hairs, which partially disappear from the upper part; *inner surface* striate, lead-coloured, smooth and shining. *Peridioles* 1-2 mm. diam., globose to elliptic, lenticular, leaden coloured, with a thin tunica. *Spores* broadly oval to egg-shaped, smooth, more or less hyaline, $7.5-14.4 \times 5.2-7.2 \mu$ (sec. Saccardo $20 \times 13.2 \mu$).

Habitat: on wood.

Distribution: South Africa; South America; Ceylon.

Specimens examined: on woody fruits, Knysna, *E. du Preez* (v. d. Byl 1330, det. Lloyd); Kirstenbosch, *M. Johns* (E. L. Stephens 554).

Specimens not seen: without locality, *Verwoerd* (Stell. 156).

Tulasne's original description has not been seen, but according to the information given in the footnote to the description in the Sylloge Fungorum (l.c.) this species resembles *C. striatus* structurally, but differs in the reddish and less hirsute outer surface and in the glabrous, only slightly striate, inner surface.

10. **Cyathus Berkeleyanus** Tulasne, [Plate LXXVII, 4th row, right.]

Monogr. Nidulariées in Ann. Sci. Nat., 3 sér., I (1884) 70.

Lloyd, Myc. Writings 2, Nidulariaceae (1906) 19; White, Nid. N. Am. in Bull. Torrey Bot. Club 29 (1902) 258; Verwoerd, Ann. Univ. Stell. 3 (1925) 36.

Cyathus microsporus var. *Berkeleyanus* Tul., Sacc. Syll. Fung. 7 (1888) 35.

Peridium 5-9 mm. high, 4-7 mm. wide at the mouth, urceolate, attenuated towards a rather broad base, attached to the substratum by a pale brown cushion-like pad; margin erect or somewhat flaring, finely fimbriate; *outer surface* clothed with matted, strigose, ochraceous-brown hairs, which originally extend over the depressed epiphragm, sometimes becoming sulcate when old; *inner surface* sulcate or not, greyish brown or slate-grey. *Peridioles* 1.5-2.5 mm. diam., lenticular, dark leaden colour due to the presence of a thin tunica, which masks the black colour. *Spores* broadly oval, obovate or sometimes subglobose, smooth, hyaline, $6.5-10 \times 5-7.2 \mu$.

Habitat: on dead wood, gregarious.

Distribution: South Africa; North America; Brazil; Cuba; Jamaica.

Specimens examined: Belvidere, Knysna, June 1921, *A. V. Duthie* 311 det. Lloyd (E. L. Stephens 65, mixed with *C. stercoreus*) 31478; Nottingham Road, Natal, v. d. Byl 556 (Lloyd Myc. Coll. 34544) 31815; v. d. Byl 60; Knysna, April 1939, *A. M. Bottomley*, 30744.

Specimens not seen: Belvidere, Knysna, *A. V. Duthie* (Lloyd Myc. Coll. 22529, 34552 34554).

A note attached to Dr. Duthie's specimen reads: "The striations are not evident on all cups. The small spores $6-8 \times 10 \mu$ are the feature of the species." In specimen v. d. Byl 60, the striations are very indistinct both internally and externally. The striate character of the cup appears to be a variable feature, since both smooth and striate plants

are found in the same collection. Lloyd (l.c. plate 107) gives illustrations of cups which are strongly sulcate both inside and outside, while White (l.c.) illustrates cups which are striate only on the inner side.

SPHAEROBOLACEAE Schroeter.

Kryptogamen-Flora von Schlesien 3 (1889) 688.

Walker, Develop. and Mechanism of Discharge in *Sphaerobolus iowensis* n. sp. and

S. stellatus Tode, in Journ. Elisha Mitchell Sci. Soc., U.S.A. 42 (1927) 151 ;

Buller, Res. on Fungi 5 (1933) 279.

Peridium subglobose, wall of four layers, containing a single peridiole, which is forcibly ejected to a distance of a few inches up to 18 feet in a horizontal direction and 14 feet in a vertical direction (Walker, l.c.) by the apical splitting of the peridium and the eversion of the two inner layers. The four layers from outside inwards consist of (1) a gelatinous layer, (2) a pseudoparenchymatous layer, (3) a fibrous layer and (4) a palisade layer. After ejection, layers (3) and (4) resemble a translucent, yellowish vesicle at the top of, and attached to the remaining outer layers of the wall. The peridiole contains, in addition to a mass of oval spores embedded in mucilage, large spherical cystidia, which form a peridial layer next to the outer wall and, scattered among the spores, a number of tear-shaped gemmae which germinate and function as spores.

This family is separated from the Nidulariaceae in having a four-layered peridial wall, a single peridiole with cystidia and gemmae in addition to spores and a complicated method of dehiscence.

The decision to include *Sphaerobolaceae* in the *Nidulariales* instead of in the *Sclerodermales* as Fischer does, is based on the findings of Walker (l.c.) who established that although in *Sphaerobolus stellatus* true glebal chambers are never present, in *S. iowensis* true chambers are present which persist up to maturity, and the basidia are arranged in definite hymenia, the hymenium lining the cavity of the glebal chamber.

SPHAEROBOLUS Tode ex Persoon.

Synopsis Methodica Fungorum (1801) 115.

Type: *Sphaerobolus stellatus* Tode ex Persoon.

Peridium subglobose, four-layered, dehiscing at the apex into stellate lobes when the two innermost layers of the wall evert and eject the single peridiole. Peridiole globose, containing a mass of smooth, hyaline, oval spores mixed with cystidia and gemmae.

According to Walker, there are only two species of *Sphaerobolus*—*S. stellatus* and *S. iowensis* Walker. Of these only the former has been found in South Africa.

Sphaerobolus stellatus Tode ex Persoon, [Plate LXXIX.]

Synopsis Methodica Fungorum (1801) 115.

Walker, Journ. Elisha Mitchell Sci. Soc., U.S.A., 42 (1927) 151.

Buller, Res. Fungi 5 (1933) 279 ; Sacc. Syll. Fung. 7 (1888) 46 ; G. H. Cunningham, Gastero. (1944) 208.

S. stercorarius Fr., Syst. Myc. 2 (1822) 310.

S. tabulosus Fr. l.c.

Carpobolus stellatus Desm., Mem. Soc. Linn. 4 (1826) 32.

Peridium. Unexpanded plant 1.5–2 mm. diam., subglobose, more or less submerged in the substratum (dung) impregnated and often covered with copious, white mycelial growth, finally splitting at the apex in stellate fashion into 6–8 acute lobes, when the plant is 2–3 mm. across the mouth. *Outer surface* straw-coloured, slightly tomentose-hairy; *inner surface* smooth, orange, fading to cream or ochraceous yellow. *Peridiole* about 1.5 mm. diam., reddish brown, finally black and shining, globose or flattened above, containing a mass of spores embedded in mucilage and mixed with a number of larger cystidia and oval or tear-shaped gemmae. *Spores* hyaline with dark epispore, usually broadly oval, sometimes subglobose, $5.1-8.5 \times 4.5 \mu$.

Habitat: usually gregarious, on twigs, sticks, decaying stumps, boards, sawdust, old sacking, dung of herbivorous animals, etc.

Distribution: South Africa; Australia; Canada; Ceylon; England; Europe; India; Japan; New Zealand; Trinidad; United States of America.

Specimens examined: on equine dung, Pretoria, Feb. 1915, *I. B. Pole Evans*, 8821; Ixopo, Natal, March 1917, *E. Hackland* (Natal Herb. 470) 15550; Hopevale, Donnybrook, Natal, Jan. 1935, *E. M. Doidge*, 27719; Fountains Valley, Pretoria, March 1936, *A. M. Bottomley* 28462; on cow dung, Kromrivier nr. Buffelspoort, Marikana, Tvl., Dec. 1938, *E. M. Doidge & A. M. Bottomley*, 30236; nr. Somerset East, *W. Tuck*, 1976 (MacOwan 1190; S.A.M. 35083).

Unless otherwise stated all photographs are the work of Mr. H. A. V. King, photographer to the Division of Botany and Plant Pathology, Pretoria.

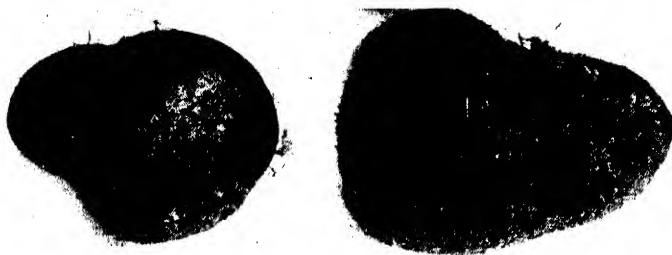
PLATE I.

Fig. 1. — *Rhizopogon luteolus*, x 1.

Fig. 2. — *Rhizopogon rubescens*, x 1.

Fig. 3. — *Hymenogaster albellus*, x 1.

Fig. 4. — *Melanogaster ambiguus*, x 1.



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PLATE II.

Fig. 1.—*Secotium Gueinzii*, x 1.

FIG. 2.—*S. Gueinzii*, basal view, x 1.

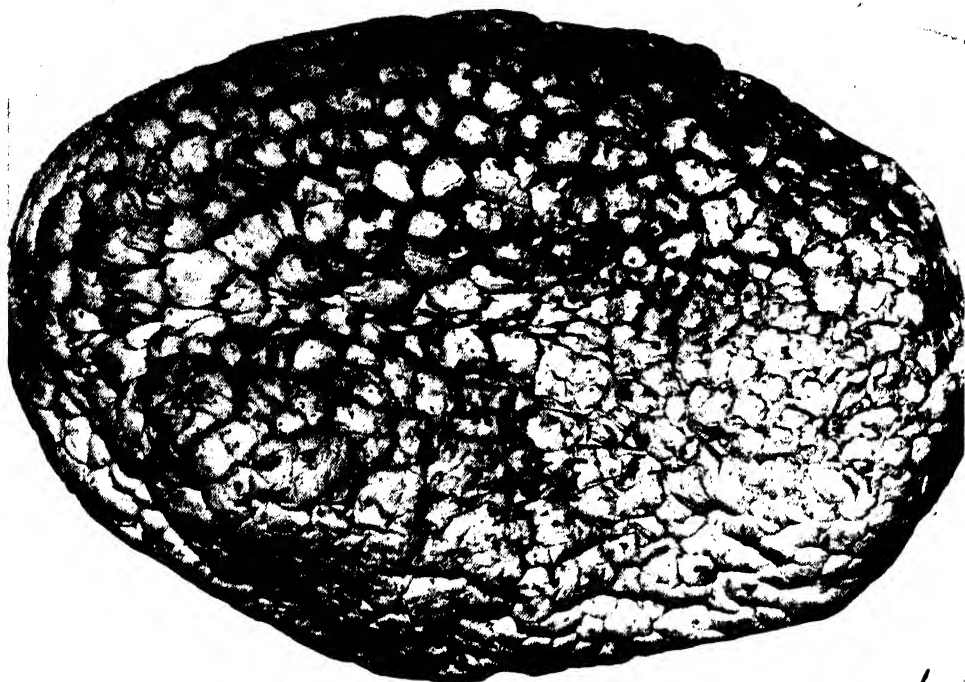


PLATE III.

Fig. 1. - Section through *Secotium Guerinii*, x 1.

Fig. 2-6. — *Secotium obtusum*, x 1.



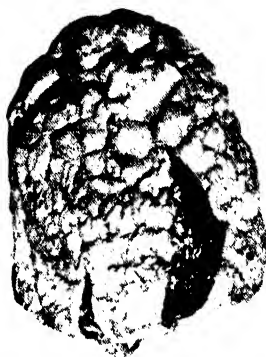
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PLATE IV.

Fig. 1. *Maconianites agaricinus* after Berkeley.

Fig. 2. *Gyropragmium Delelei*. Microscopic section through trana plate.



FIG. 141.—*MACOWANIA AGARICINA*.



PLATE V.

Fig. 1.—*Polyplocium inquinans*, young plants growing from antheap.
Reduced.

Photograph by I. B. Pole Evans.



PLATE VI.

Fig. 1. —*Polyplocium inquinans*, immature plant, reduced.

Fig. 2. —*P. inquinans*, section through (1).

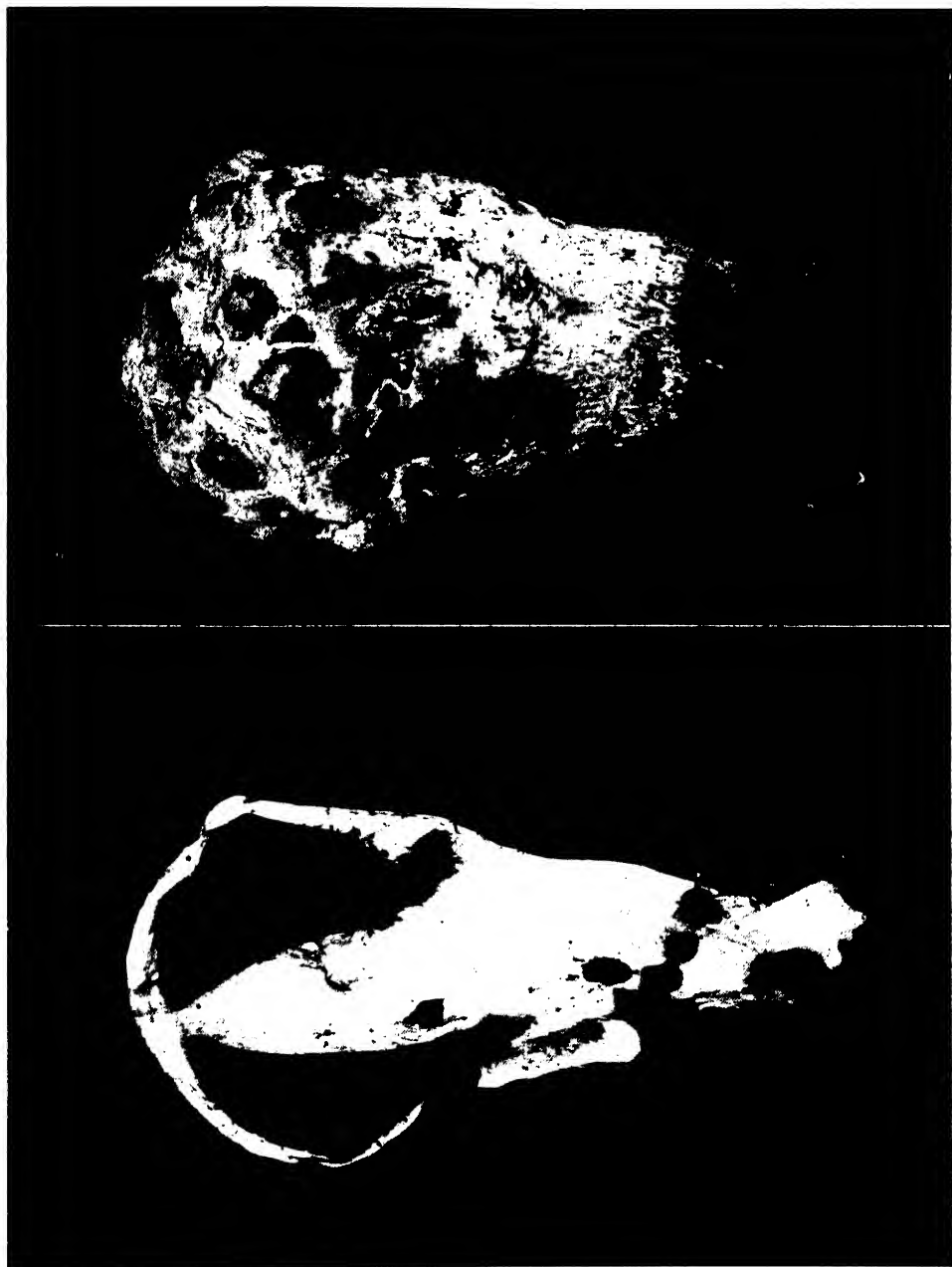


PLATE VII.

Polyplocium inquinans, mature plant, x 3.



PLATE VIII.

Polyplocium inquinans, mature plant showing warts on peridium
and volva, x 1.



PLATE IX.

Gyrophragmium Delilei, mature plants, x 1.



PLATE X.

Fig. 1.—*Mutinus Curtisii*, after Lloyd as *M. elegans*, x 1.

Fig. 2.—*Mutinus bambusinus* after Lloyd, x 1.



PLATE XI.

Itajahya galericulata.---Stages in "egg" development, x 1.

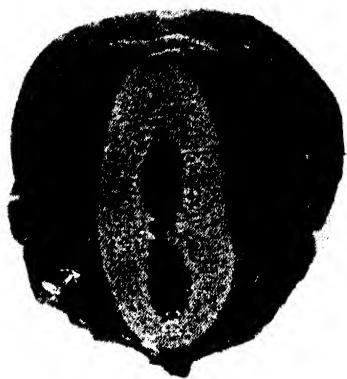
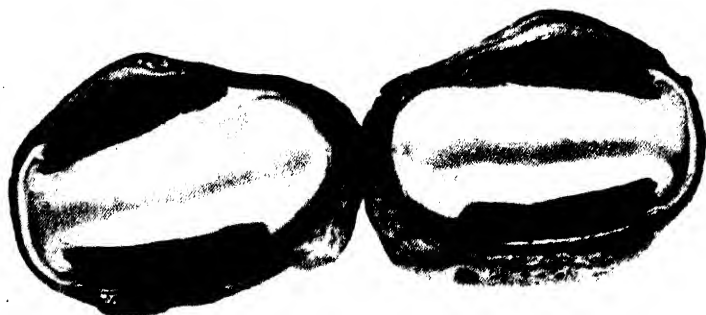


PLATE XII.

Hajahya galericulata.—Stage I in development of plant, x 1.



PLATE XIII.

Itajahya galericulata. Stage II in development of plant, x 1.



PLATE XIV.

Itajahya galericulata. Stage III in development of plant, x 1.



PLATE XV.

Fig. 1. *Itajahya galericulata*. Mature plant, slender form, x 1.

Fig. 2. *Itajahya galericulata*.--Pileus with volva cap present, x 1.

Photographs by L. Kresfelder.

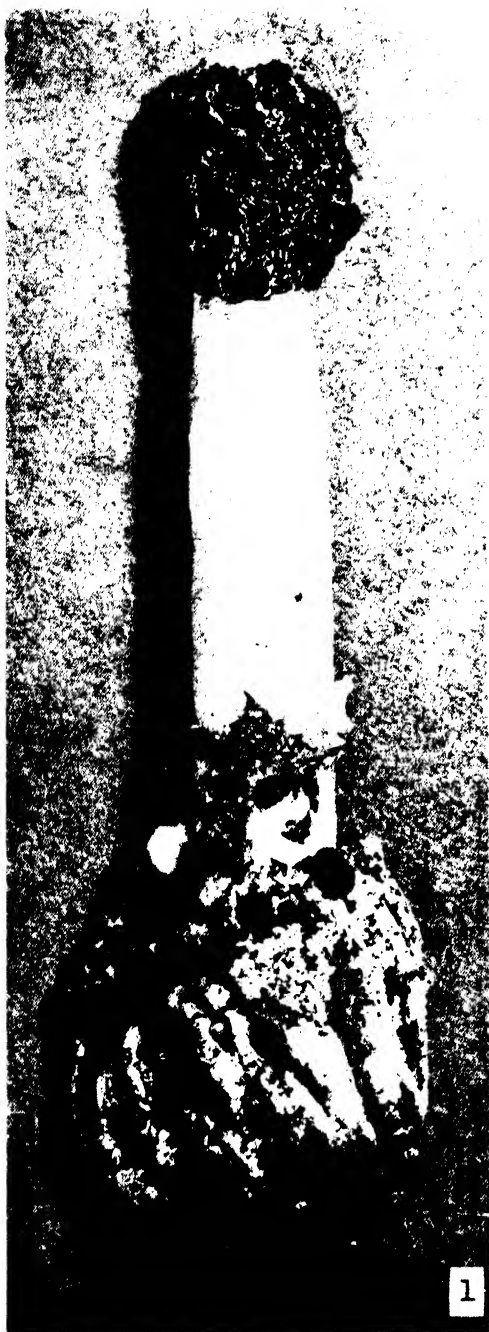


PLATE XVI.

- Fig. 1. — *Itajahya galericulata*, section through pileus, x 1.
 Fig. 2. — *I. galericulata*, pileus with part of spore mass removed, x 1.
 Fig. 3. — *I. galericulata*, section through pileus after removal of spore mass.

Photographs by L. Kresfelder.

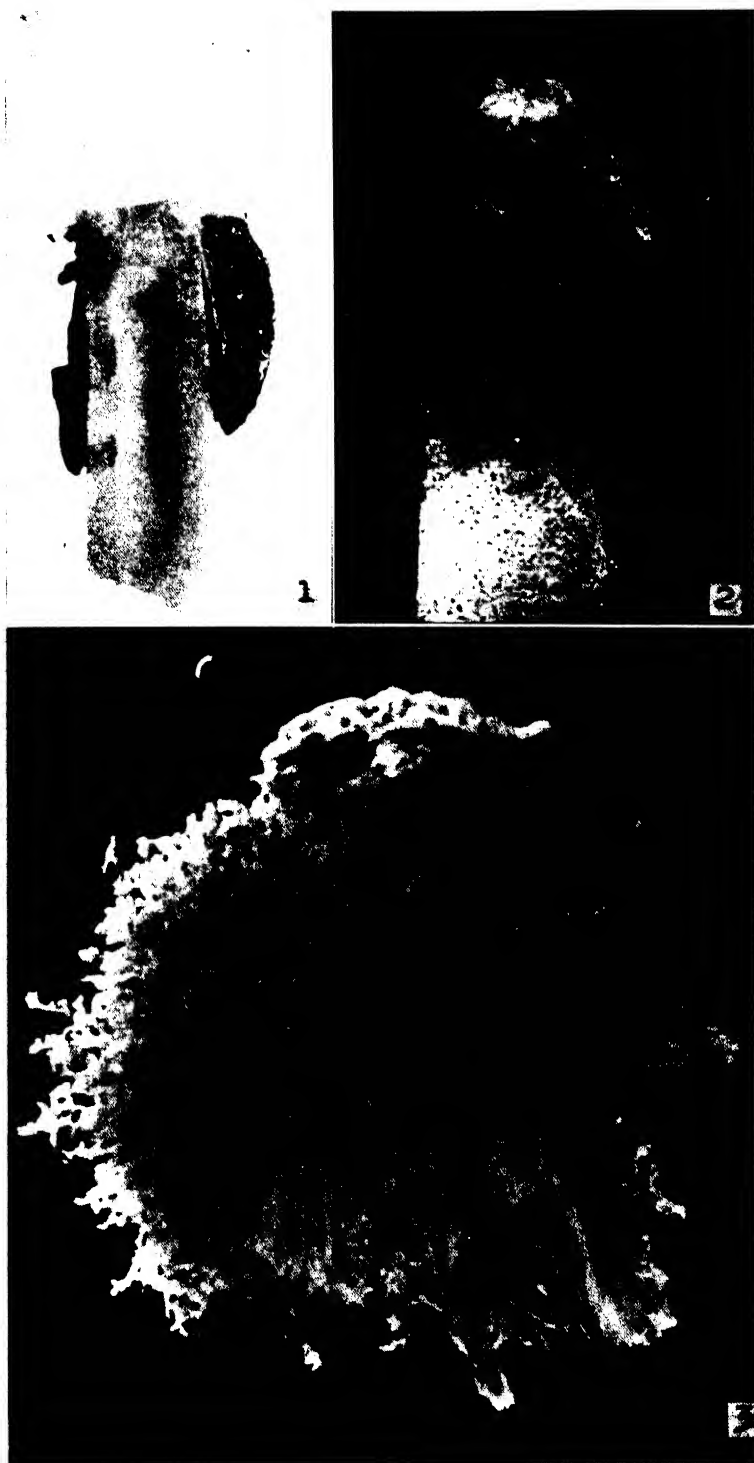


PLATE XVII.

Phallus impudicus after Lloyd.

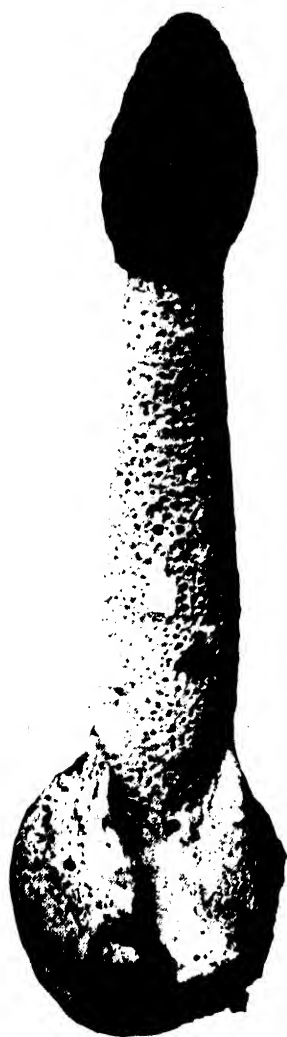


PLATE XVIII.

Fig. 1. *Phallus rubicundus*, old specimens developed indoors and "eggs", x 1.

Fig. 2. *P. rubicundus*, mature plants with remains of volva on apex of pileus, x 1.

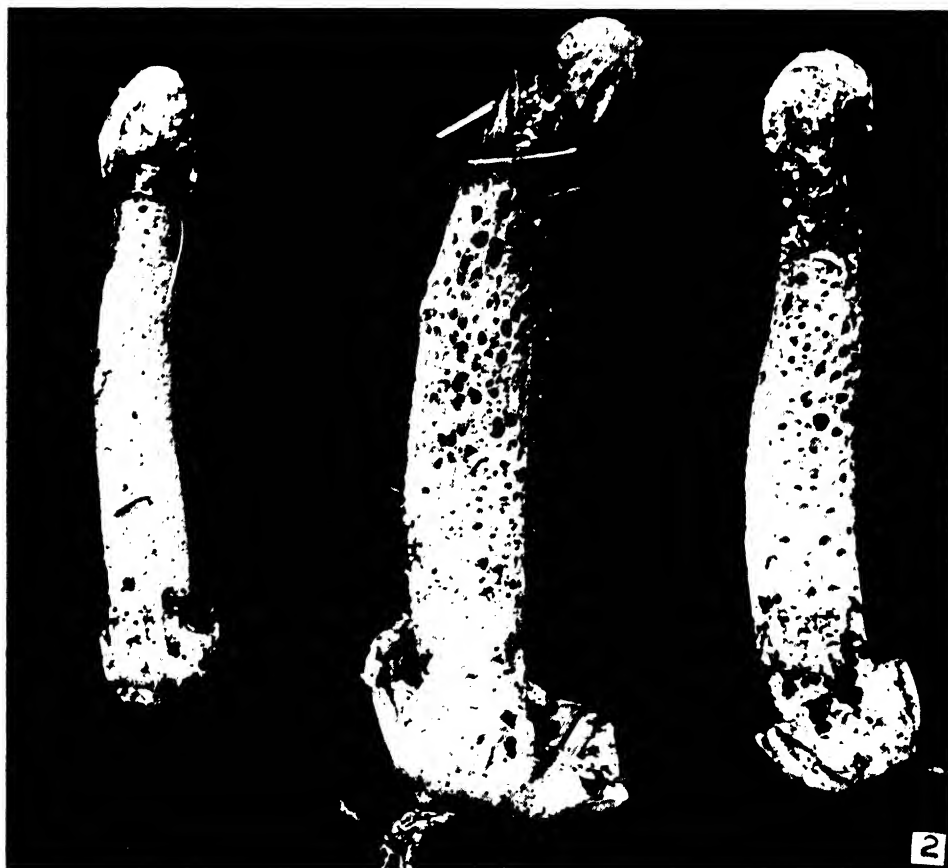


PLATE XIX.

Fig. 1.—*Dictyophora indusiata*, mature plant, x 1.

Fig. 2.—*D. indusiata*, developed indoors, showing pileus without
spore mass, x $\frac{1}{2}$.

Fig. 3. *D. indusiata* after Moeller.

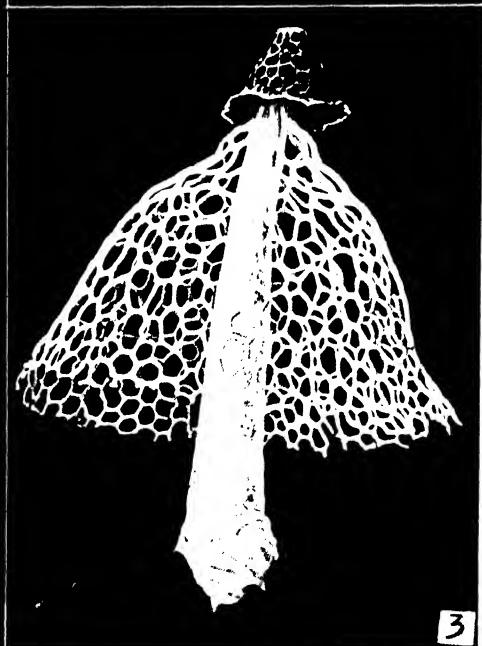
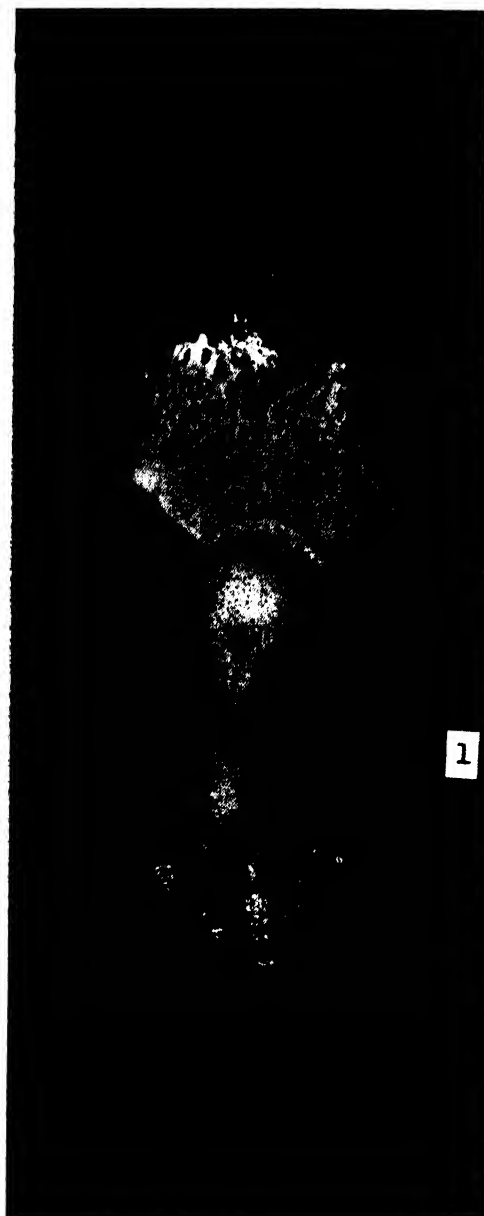


PLATE XX.

Fig. 1.— *Linderiella columnata* after Welwitch and Currey.

Fig. 2.— *L. columnata* after G. H. Cunningham

Fig. 3. *Aseroe rubra* after G. H. Cunningham.

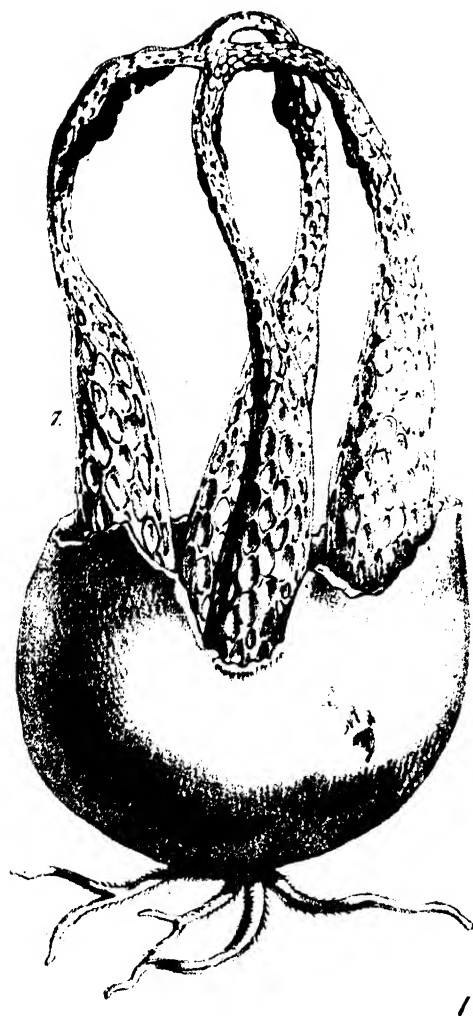


PLATE XXI.

Figs. 1 and 2.—*Anthurus Archeri*. Note external longitudinal groove on arms, x 1.

Photographs supplied by Miss E. L. Stephens.

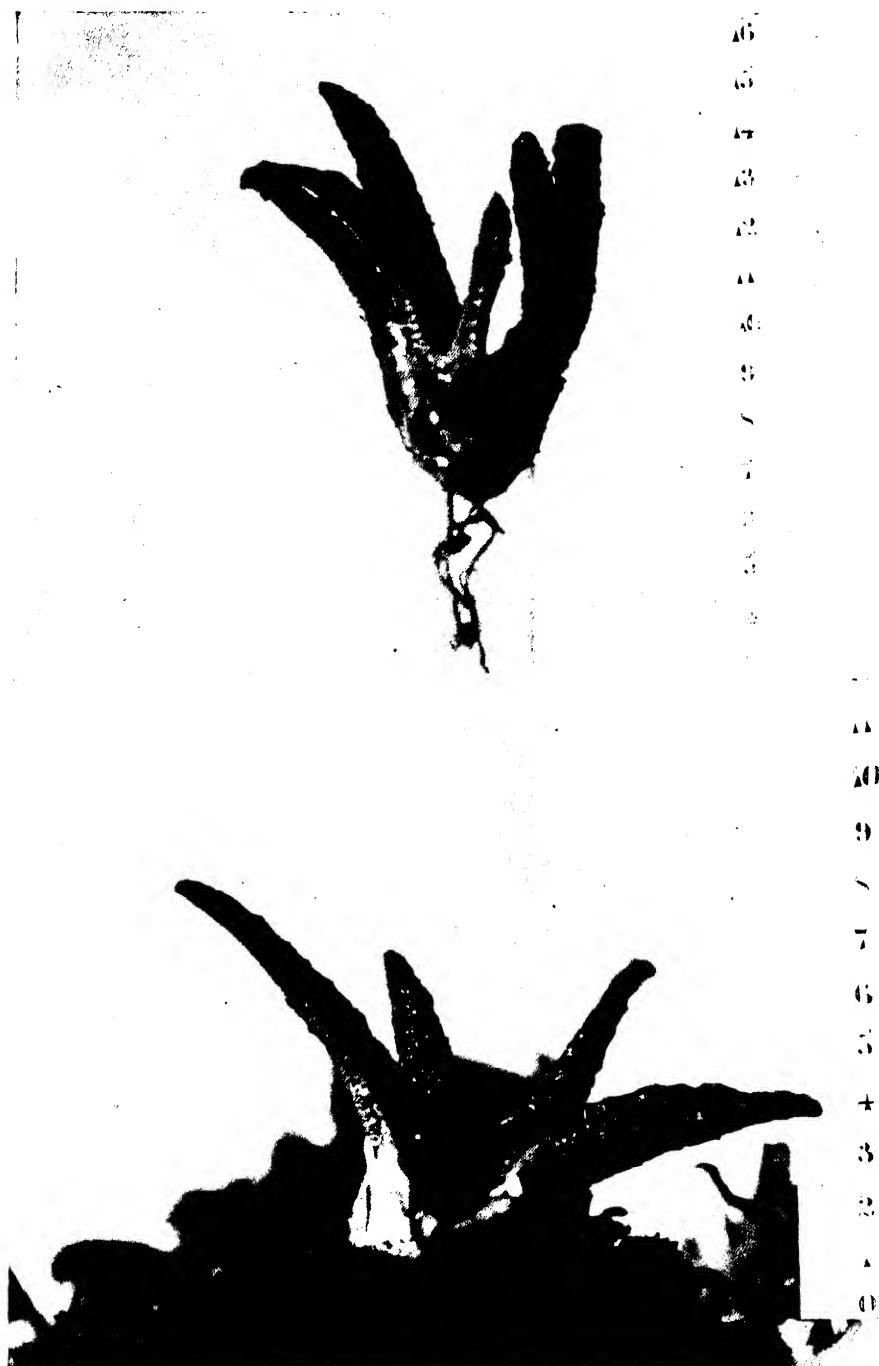


PLATE XXII.

Lysurus Gardneri, plants developed indoors from "eggs", x 1.



PLATE XXIII.

Fig. 1.—*Kalchbrennera corallocephala*, development of plant from
“ egg ” stage.

Photograph of sketch by Miss G. J. Lewis.

Figs. 2 and 3. —*K. corallocephala*, mature plant.

Photographs by I. B. Pole Evans.



PLATE XXIV.

Kalchbrennera corallocephala.— Photograph of original painting
by Kalchbrenner as *K. Tuckii*.



PLATE XXV.

Fig. 1.—*Clathrus gracilis*, developed indoors from "egg".

Photograph supplied by Miss E. L. Stephens.

Fig. 2. *Clathrus camerunensis* after v. d. Byl.

Fig. 3. *Mutinus simplex* after Lloyd.



PLATE XXVI.

Fig. 1.—*Clathrella* cfr. *pseudocancellata*, dry plant, x 1.

Fig. 2.—Same, fresh plant, x 1.

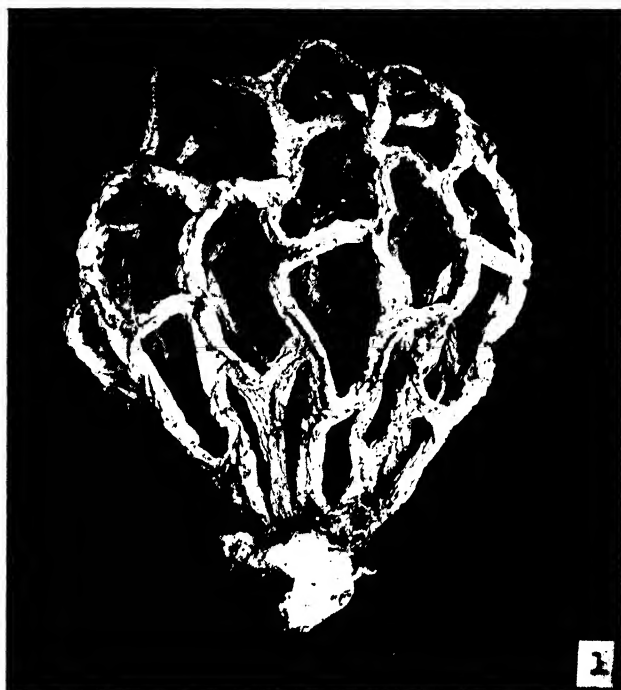


PLATE XXVII.

Clathrus sp., x 1.



PLATE XXVIII.

Fig. 1.—*Scleroderma cepa*, x 1.

Fig. 2.—*Scleroderma verrucosum*, x 1.



PLATE XXIX.

Fig. 1.—*Scleroderma cepa*, section, x 1.

Fig. 2.—*Scleroderma verrucosum*, section, x 1.



PLATE XXX.

Figs. 1 and 2.—*Scleroderma flavidum*, x 1.



PLATE XXXI.

Fig. 1. *Arachnion album*, after Lloyd.

Fig. 2.—*Scleroderma aurantium*, x 1.

Fig. 3.—*Scleroderma flavidum*, x 1.

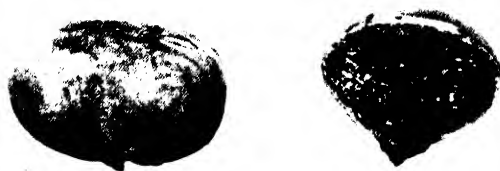
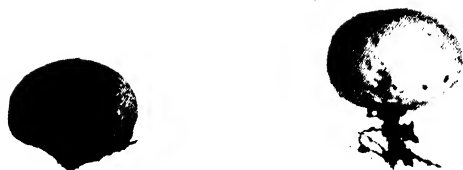


PLATE XXXII.

Fig. 1.—*Pisolithus tinctorius*, x 1.

Fig. 2.—*P. tinctorius*, apically split showing structure of gleba, x 1

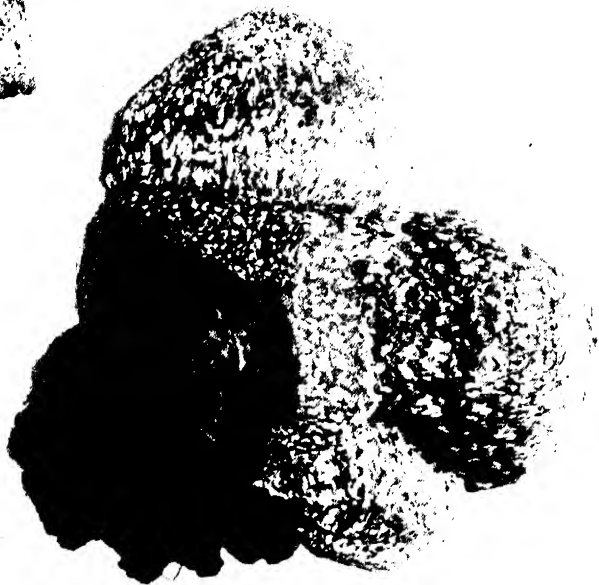


PLATE XXXIII.

Fig. 1. *Lycoperdon hyemale*, typical form, x 1.

Fig. 2. --*L. hyemale*, section of old plant showing sterile base and diaphragm, x 1.

Fig. 3. --*L. hyemale* showing mouth, x 1.

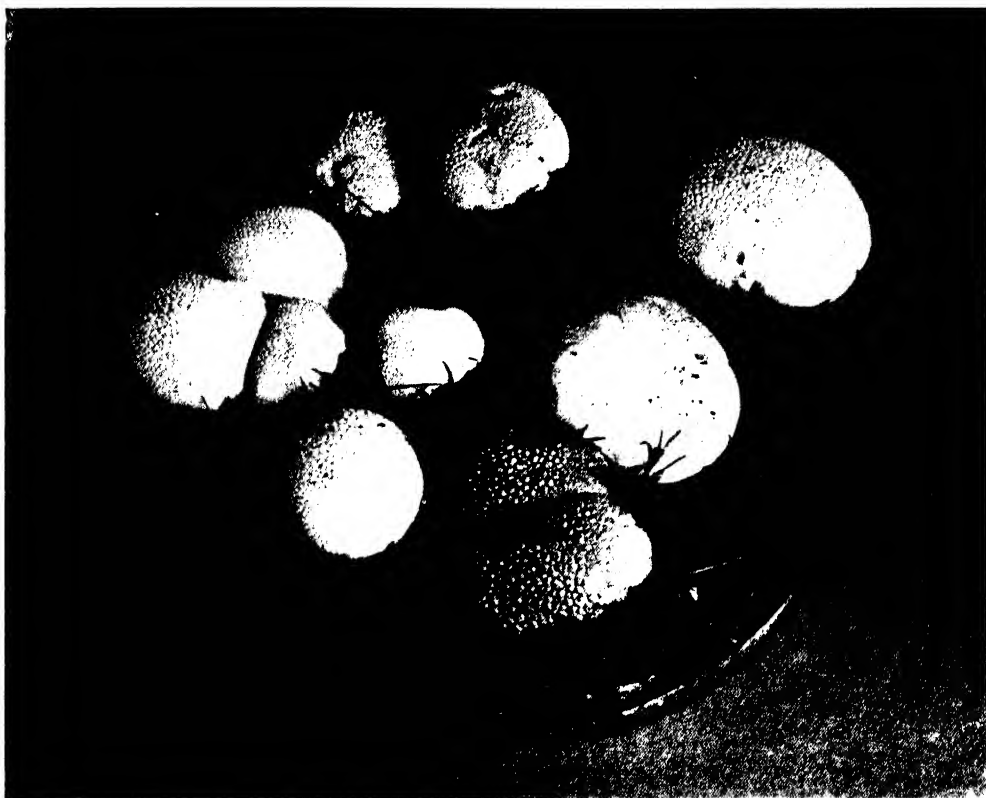


PLATE XXXIV.

Top row.—*Lycopodium hyemale*, unusual form in which exoperidium has completely disappeared, x 1.

Middle row.—*L. hyemale*, form with large irregular mouth, x 1.

Bottom row. *L. hyemale*, connivent spines enlarged.



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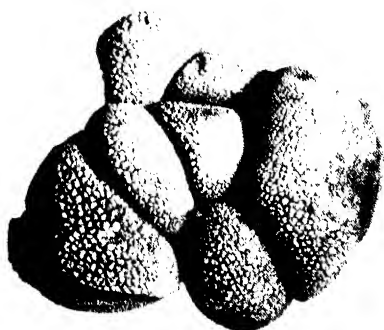


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PLATE XXXV.

Fig. 1.—*Lycopodium perlatum*, x 4.

Fig. 2.—*Lycopodium djurense*, x 4.



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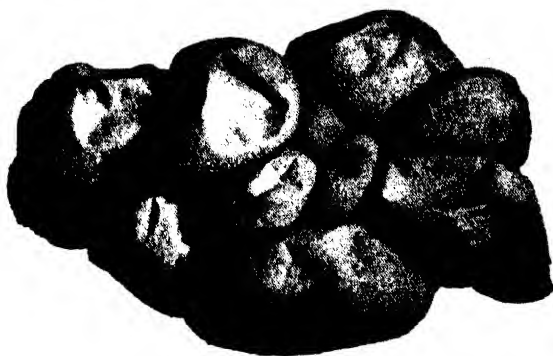


PLATE XXXVI.

Fig. 1. *Lycoperdon flavum*, after Massee.

Fig. 2. *L. flavum*, fresh plant, x 1.

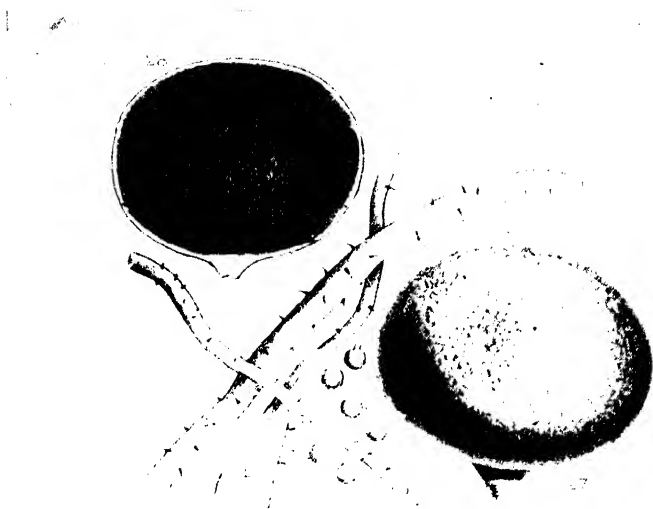


PLATE XXXVII.

Lycopodium asperum after Lloyd as *Boristella aspera*.



Fig. 6.

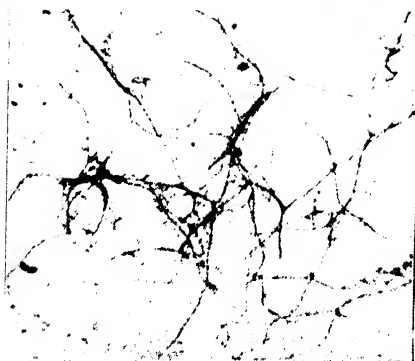


Fig. 10.



Fig. 7.



Fig. 8.



Fig. 9.

PLATE XXXVIII.

Fig. 1.— *Lycoperdon polymorphum*, x 1.

Fig. 2.— *L. pusillum*, fresh plant, x 1.

Fig. 3 -- *L. pusillum*, dried plant, x 1.



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PLATE XXXIX.

Fig. 1.—*Lycopodium Gunnii*, x 1.

Fig. 2. *L. Qudenii*, x 1.

Fig. 3.—*L. Duthiei*, x 1.

Fig. 4. *Borista umbrina*, pressed specimen, x 1.

Fig. 5.—*Calceolaria incerta*, x 1.



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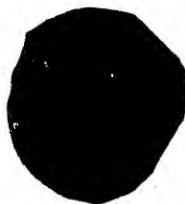
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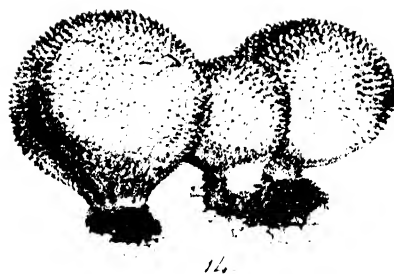
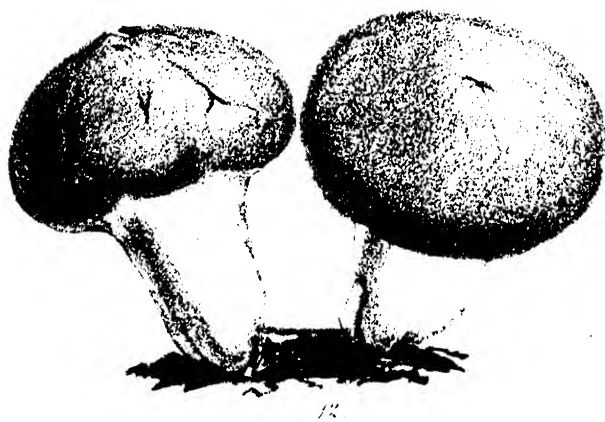
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PLATE XL.

Fig. 1.—*Lycoperdon capense* after Massee.

Fig. 2.—*L. bicolor* after Massee.

Fig. 3.—*L. asperrimum* after Massee.



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PLATE XLI.

Fig. 1. *Calvatia candida*, x 1.

Fig. 2. *C. lilacina*, x 1.

Fig. 3. *C. lilacina*, after gleba has disappeared, x 1.



PLATE XLII.

Fig. 1. — *Calvatia caelata*, x 1.

Photograph by. I. B. Pole Evans.

Fig. 2.—*C. lepidophora* with warty exoperidium, x 1.



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PLATE XLIII.

Fig. 1. *Calvatia lepidophora* with granular exoperidium, x 1.



PLATE XLIV.

Fig. 1.—*Calvatia gigantea*, x 1.

Fig. 2. *C. pachyderma*, x 1.

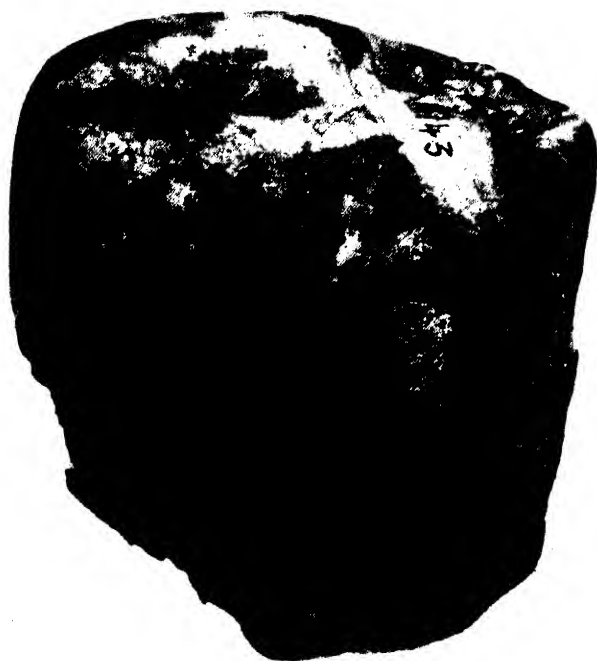


PLATE XLV.

Lanophila Wahlbergii, x 1.



PLATE XLVI.

Broomeia congregata, taken from base of *Acacia* tree.

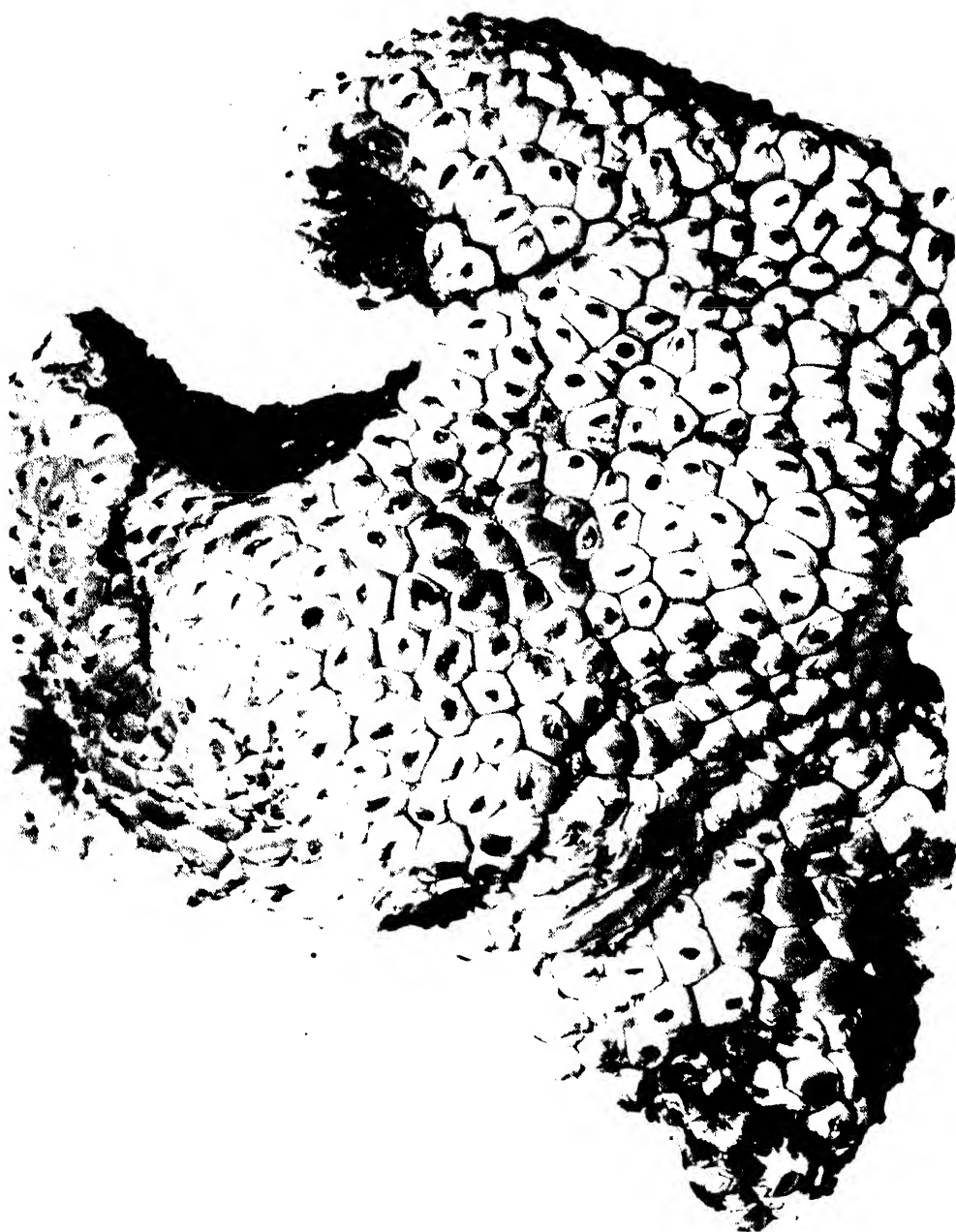
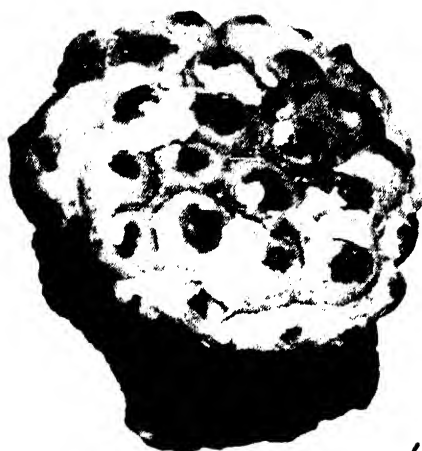
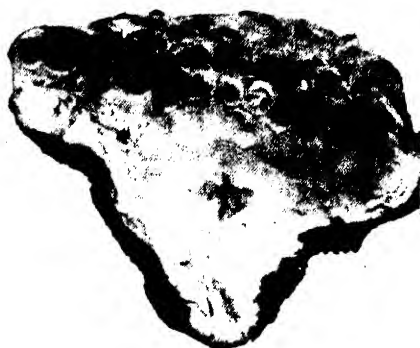


PLATE XLVII.

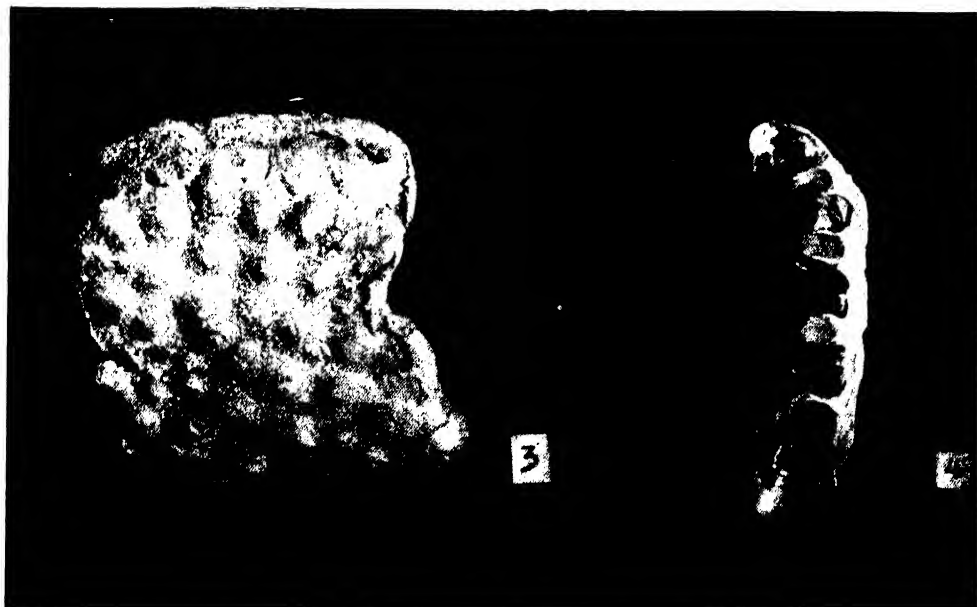
- Fig. 1.—*Broomeia congregata* with remains of universal veil, x 1.
Fig. 2.—*B. congregata*, vertical section showing thick stroma, x 1.
Fig. 3.—*B. ellipsospora*, underside, x 1.
Fig. 4.—*B. ellipsospora*, vertical section showing thin stroma, x 1.



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PLATE XLVIII.

Fig. 1.—*Diplocystis Wrightii*. Note peridia separated by individual exoperidial walls, x 1.

Fig. 2.—*Broomeia congregata*.—Note peridia separated by common alveolar walls, x 1.

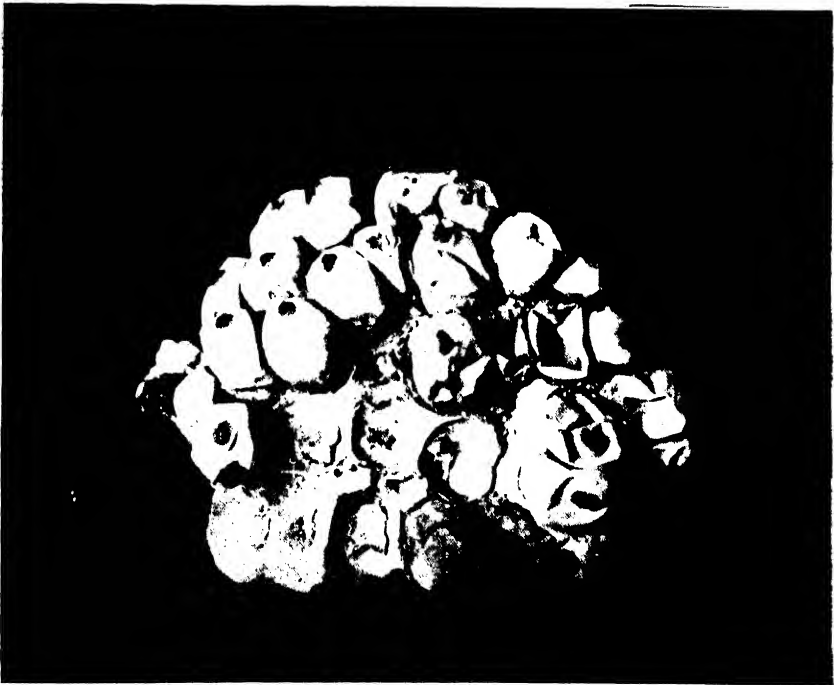
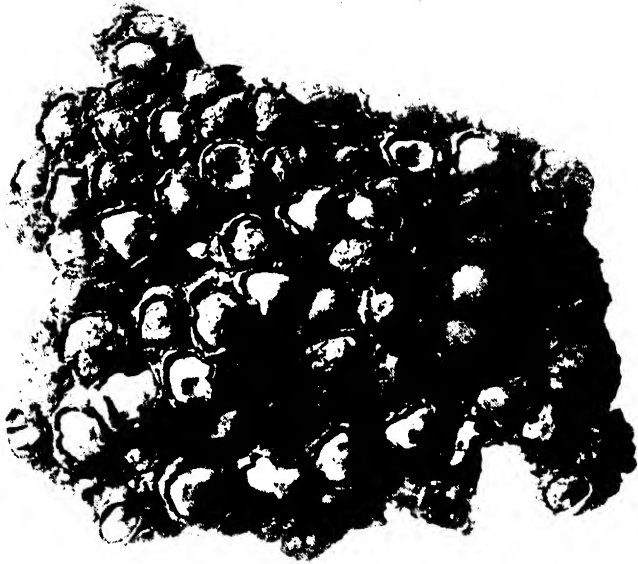


PLATE XLIX.

Fig. 1.—*Geastrum pectinatum* with grooved base, x 1.

Fig. 2.—*G. pectinatum* with smooth base, x 1.

Fig. 3.—*G. pectinatum* with collar on pedicel, x 1.

Fig. 4.—*G. pectinatum* with incurved exoperidium, x 1.

Fig. 5.—*G. Bryanti*.

Fig. 6.—*G. nanum*.

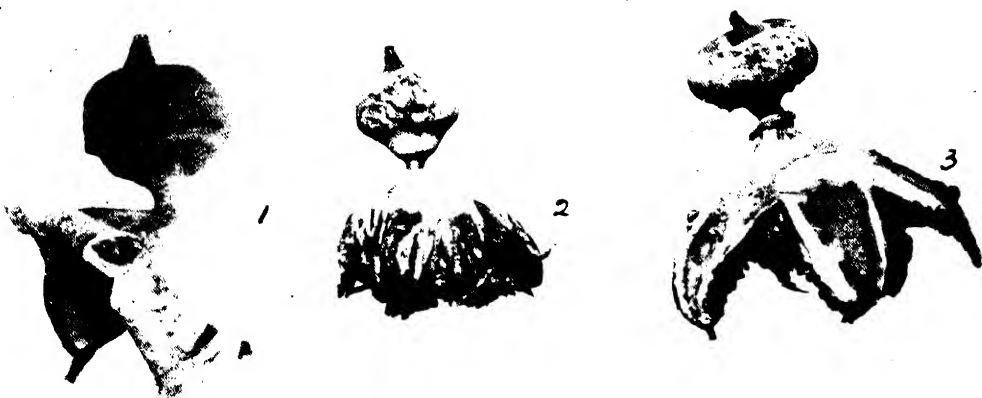
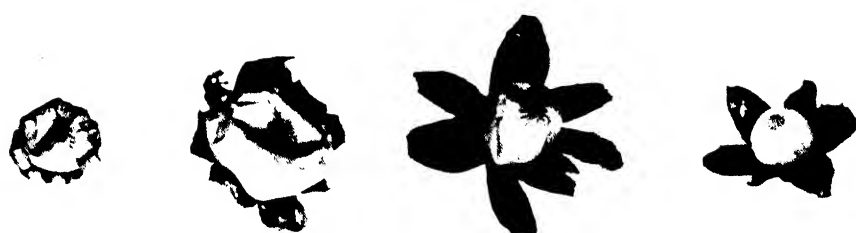


PLATE I.

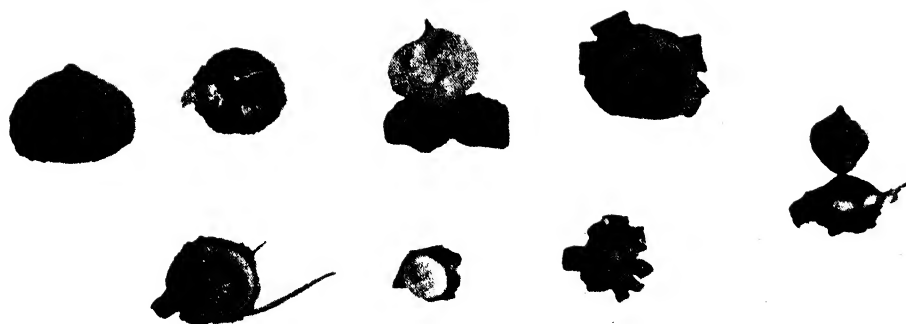
Fig. 1.—*Geastrum quadrifidum*, x 1.

Fig. 2.—*G. nanum*, x 1.

Fig. 3.—*G. campestre*, x 1.



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PLATE LI.

- Fig. 1. *Geastrum dissimile*, x 1.
Fig. 2. *G. dissimile* with mouth enlarged.
Fig. 3.—*G. quadrifidum* with mouth enlarged.
Fig. 4.—*G. fornicatum* with mouth enlarged.



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PLATE LII.

Top row.—*Geastrum minimum*, after Lloyd as “*Geaster granulosis*”.

Second and Third rows. *G. minimum*.

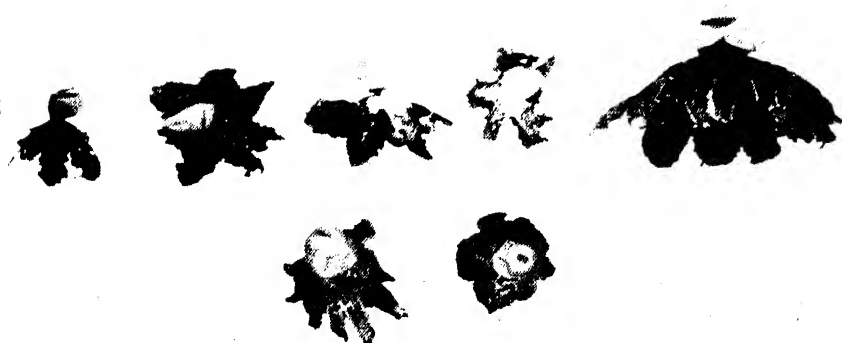
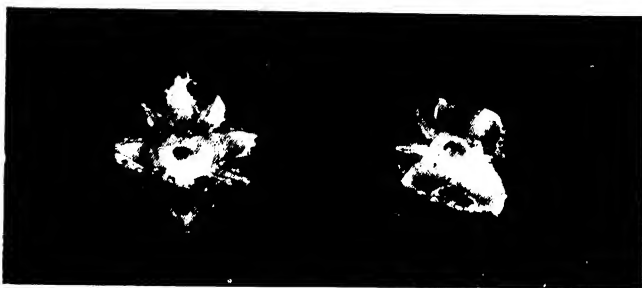


PLATE I.III.

Top row.—*Geastrum limbatum*, usual form, x 1.

Middle row.—*G. limbatum*, unexpanded plant and egg, x 1.

Bottom row.—*G. limbatum*, form with ellipsoid mouth, x 1.

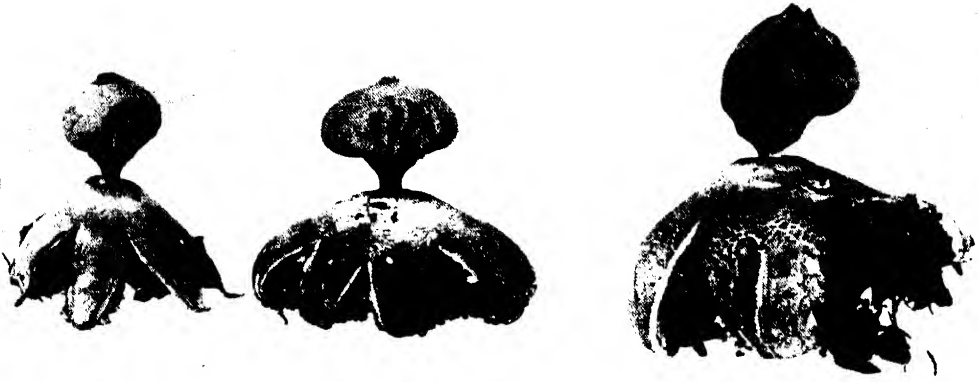


PLATE LIV.

Top row.—*Geastrum triplex*, underside showing typical mycelial layer, x 1.

Middle row.—*G. triplex*, small type of plant with acuminate pointed unexpanded plants.

Bottom row.—*G. triplex*. -Two figures on left, photographs of MacOwan No. 1124 specimens as *Geaster fimbriatus*. Figures on right, photograph of MacOwan's specimen No. 1236 as *Geaster capensis*.

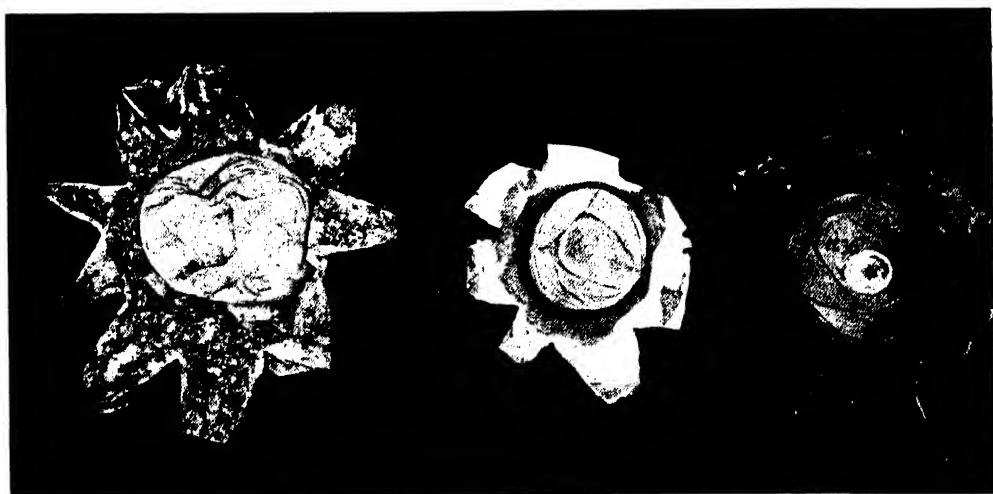
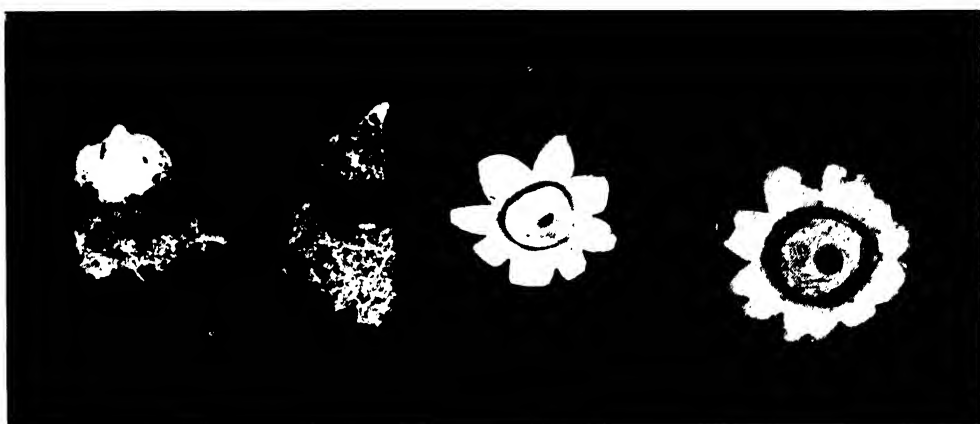


PLATE LV.

Gastrum triplex, fresh plants, x 1.

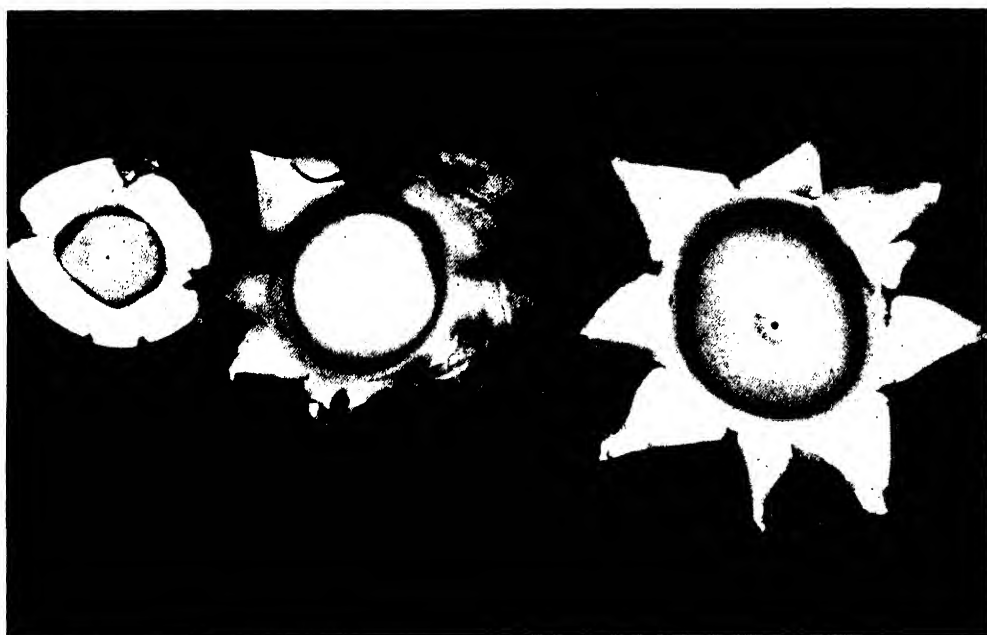


PLATE LVI.

Fig. 1. - *Geastrum saccatum*, typical plants with subglobose and pointed unexpanded plants, x 1.

Fig. 2. - *G. saccatum*, large type, x 1.



PLATE LVII.

Fig. 1.—*Geastrum mirabile*, x 1.

Fig. 2.—*Geastrum velutinum*, x 1.

Fig. 3.—*Geastrum arenarium*, x 1.



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PLATE LVIII.

Geastrum fornicatum, with and without the mycelial cup, x 1.



PLATE LIX.

Upper row.—*Geastrum floriforme*, x 1.

Lower row.—*G. Hieronymi*, x 1.

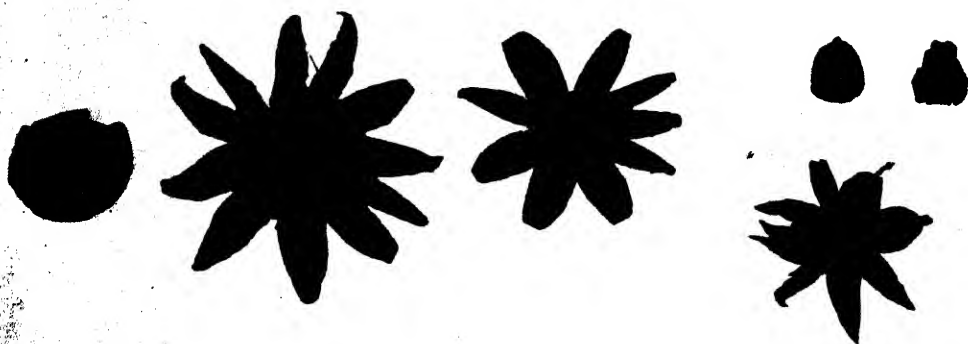
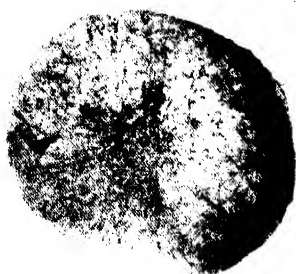


PLATE LX.

Fig. 1. *Gcastrum hygrometricum*, unexpanded plant, x 1.

Fig. 2. *G. hygrometricum* in dry weather, x 1.

Figs. 3 and 4. *G. hygrometricum* in wet weather, x 1.



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PLATE LXI.

Fig. 1.—“*Geaster MacOwani*” after Lloyd.

Fig. 2.—“*Geaster calceus*” after Lloyd.

Figs. 3 and 4.—*Myriostoma coliforme*, x 1.



PLATE LXII.

Left. *Geasteropsis Conrathi*, underside of young plant.

Right. *G. Conrathi* upper view. Note membranous endoperidium and columella from which gleba has partly disappeared.

Photograph by J. P. H. Acocks.



PLATE LXIII.

Fig. 1.—*Geasteropsis Conrathi*, section through immature plant, x 1.

Fig. 2.—*G. Conrathi*, mature plant. Note torn endoperidium, x1



PLATE LXIV.

Fig. 1.—*Disciseda candida*, x 1.

Fig. 2. *D. candida*, enlargement of upper surface.

Fig. 3.—*D. pedicellata*, x 1.

Fig. 4.—*D. verrucosa*, x 1.



PLATE LXV.

Mycenastrum corium, expanding plant, x 1.



PLATE LXVI.

Fig. 1. — *Tulostoma albicans*, x 1.

Fig. 2. — *T. cyclophorum*, x 1.

Fig. 3. *T. purpusii*, x 1.

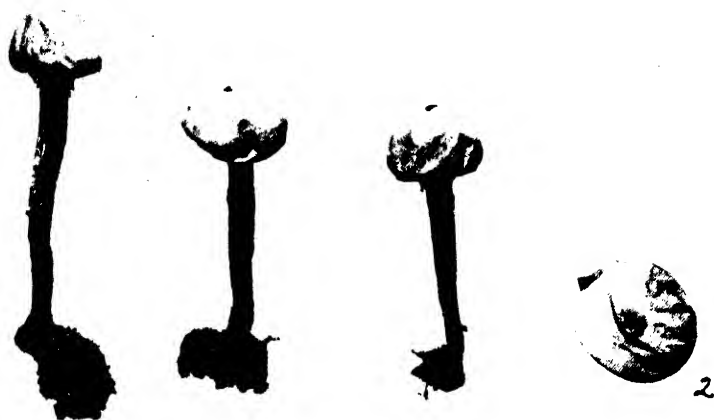
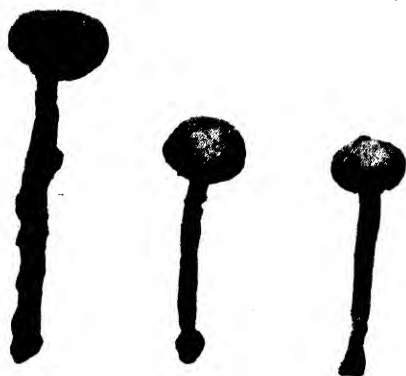


PLATE LXVII.

Fig. 1. *Tulostoma australianum*, x 1.

Fig. 2.—*T. transvaalii*, x 1.

Fig. 3.—*T. bonianum*, x 1.



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PLATE LXVIII.

Tulostoma ? albicans, x 1.



PLATE LXIX.

Batarrea Steveni, x 1.



PLATE LXX.

Fig. 1. *Batarrea Digueti* before dehiscence, x 1.

Fig. 2. *Batarrea Stereoi* after disappearance of gleba, x 1.



PLATE LXXI.

Fig. 1. *Phellorina inquinans*, x 1.

Fig. 2. *P. inquinans* vertical section showing gleba seated on expanded apex of stem, x 1.



PLATE LXXII.

Fig. 2.—*Phellorina strobilina*, dried plant, x 1.

Fig 2.—*P. strobilina* with portion of exoperidium and gleba removed,
x 1.



PLATE LXXIII.

Chlamydopus Meyenianus, x 1.

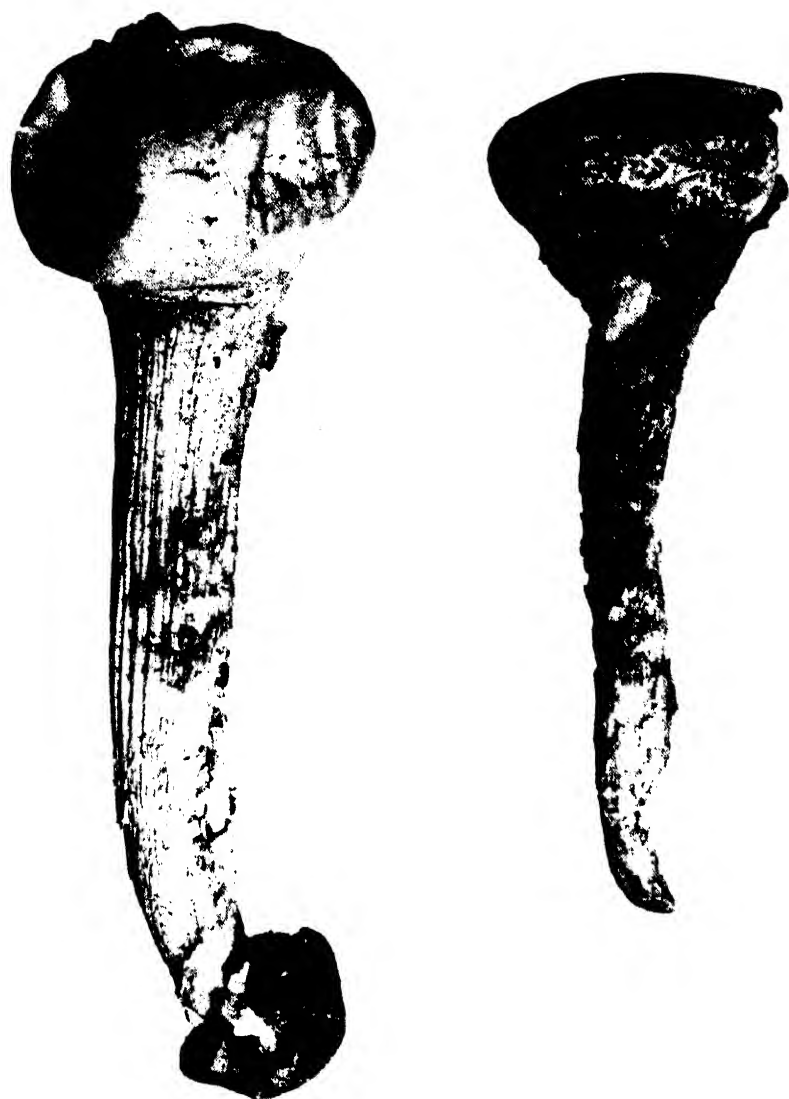


PLATE LXXIV.

Podaris pistillaris growing on "antheap", x 1.



PLATE LXXV.

Podaxis pistillaris on red gravel.



PLATE LXXVI.

Fig. 1.—*Podaris pistillaris* in natural habitat.

Fig. 2.—*P. pistillaris*, vertical section showing percurrent columella,
x 1.

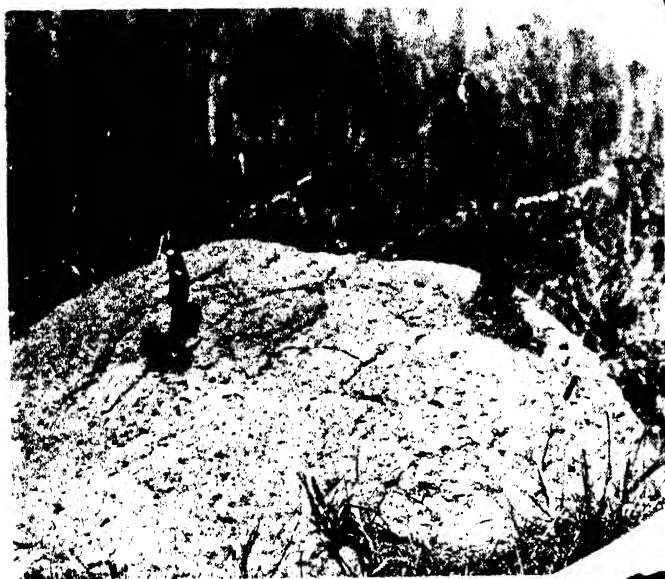


PLATE LXXVII.

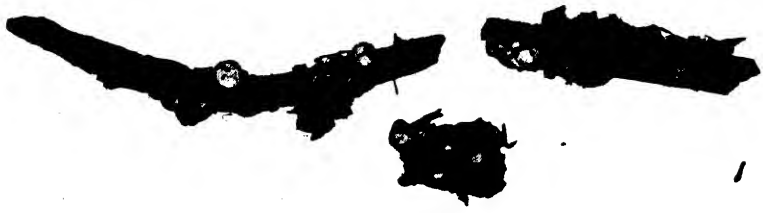
Top row. —*Crucibulum vulgare*, x 1.

Second row.—*Cyathus Hookeri*, x 1.

Third row.—*C. microsporus*, x 1.

Fourth row : Left.—*C. Montagnei* after Lloyd.

Right. — *C. Berkeleyanus* after Lloyd.



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PLATE LXXVIII.

First row.—*Cyathus olla*, x 1.

Second row.— *Cyathus stercoreus*, usual and *Leseurii* form, x 1.

Third row.—*Cyathus pallidus*, x 1.

Fourth row. *C. Poeppigii*, x 1.



PLATE LXXIX.

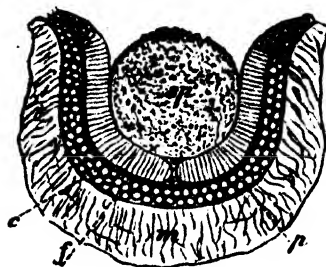
Fig. 1. *Sphaerobolus stellatus* on manure, x 1.

Fig. 2.—*S. stellatus*, diagrammatic median section through mature fruit-body after opening stellately and just before discharge of the gleba, after Buller.

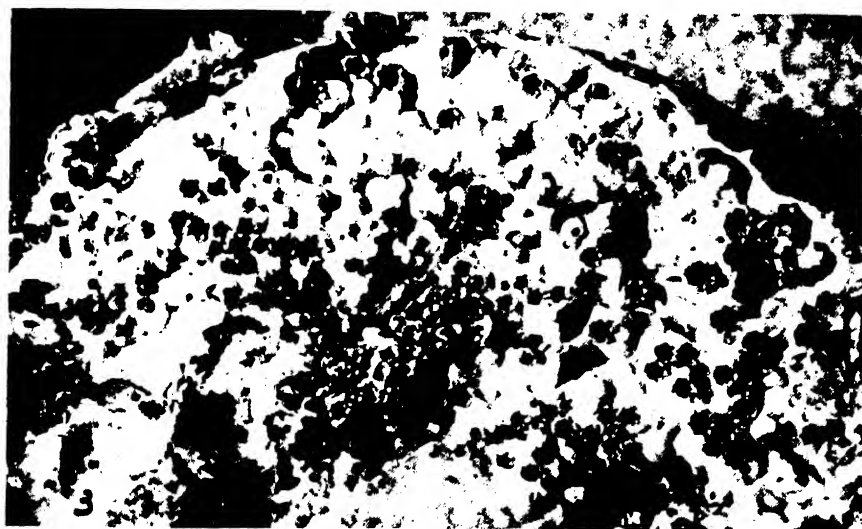
Fig. 3. *S. stellatus*, culture on horse dung, x $1\frac{1}{3}$. After Buller.



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Synonyms are shown in *italics*. Page numbers in heavy type indicate the main reference.

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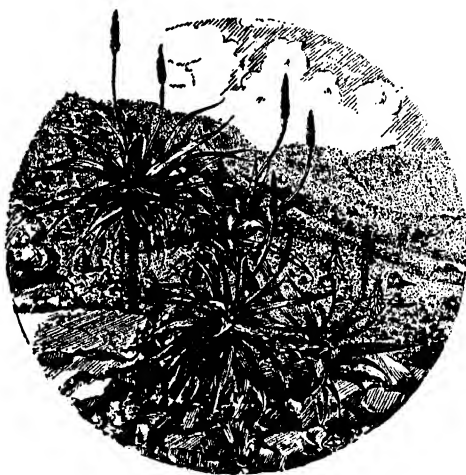
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30 JUN 1952

Bothalia

A RECORD OF
CONTRIBUTIONS
FROM THE
NATIONAL HERBARIUM
UNION OF SOUTH AFRICA
PRETORIA



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THE METHOD OF PARASITISM OF SOME SOUTH AFRICAN MICROTHYRIALES.

By C. G. Hansford.

The present paper deals with five species which were considered by Doidge in her review of the South African Microthyriaceae* as showing fairly close relationship to one another, chiefly owing to the rarity of hyphopodia on the external mycelium. In view of the wide range of absorption mechanisms in the Microthyriales, it was felt advisable to investigate the present five species in detail, and the writer is indebted to Dr. Doidge for supply of material of each species for examination. Transverse sections of infected leaves

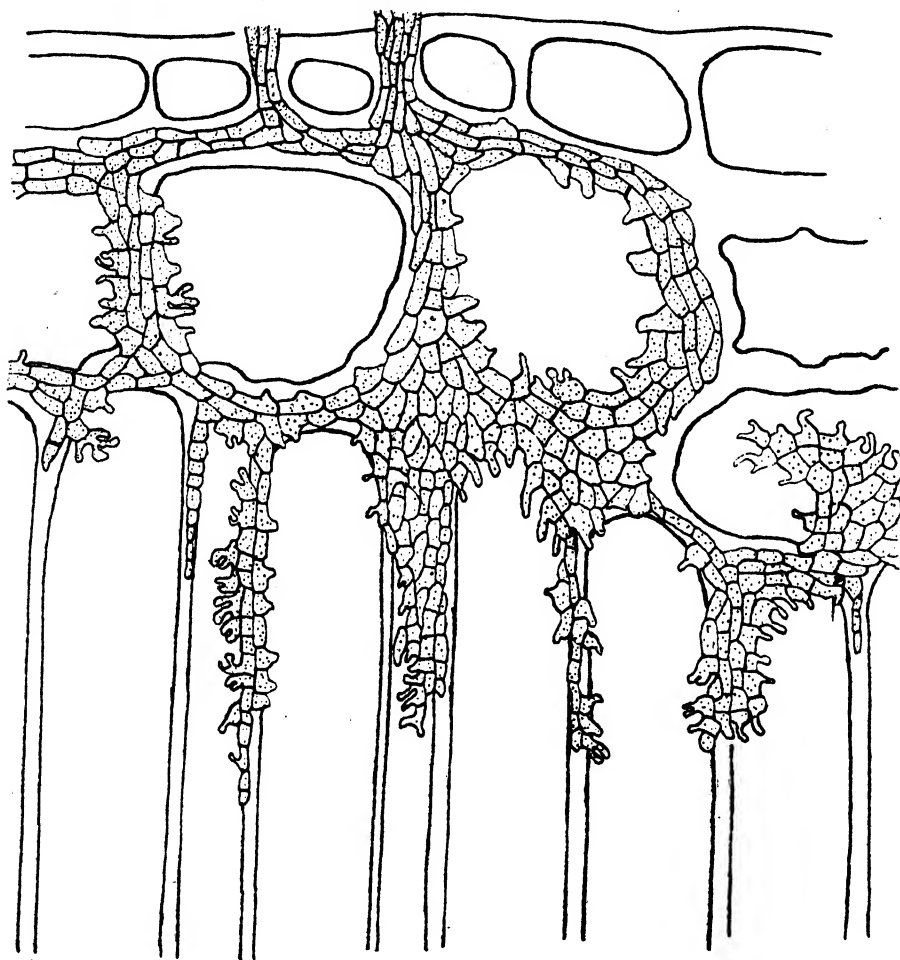


FIG. 1.

* Doidge, E. M., Revision of South African Microthyriaceae. Bothalia IV, p. 273, 1942.

were cut and stained in Gueguen's stain, to obtain details of the absorption mechanism of each fungus, and the results obtained were checked by cutting horizontal sections so as to trace the connection of the internal mycelium or haustoria with the external mycelium and hyphopodia.

***Asterina dissiliens* (Syd.) Doidge.**

in *Bothalia* IV, p. 287, 1942.

In this species the hyphopodia are few and only on the main hyphae of the mycelium. Below the centre of the colony there is an extensive internal mycelium of hyaline hyphae penetrating through the cuticle and between the cells of the epidermis to form a thin layer around the upper ends of the palisade cells. The whole of this internal mycelium is divided by cross septa into small cells, and is entirely intercellular; it encloses the subepidermal and upper parts of the palisade cells with a thin plate of mycelium, usually one cell thick. In Fig. 1 this internal mycelium is shown in transverse section; the digitate processes

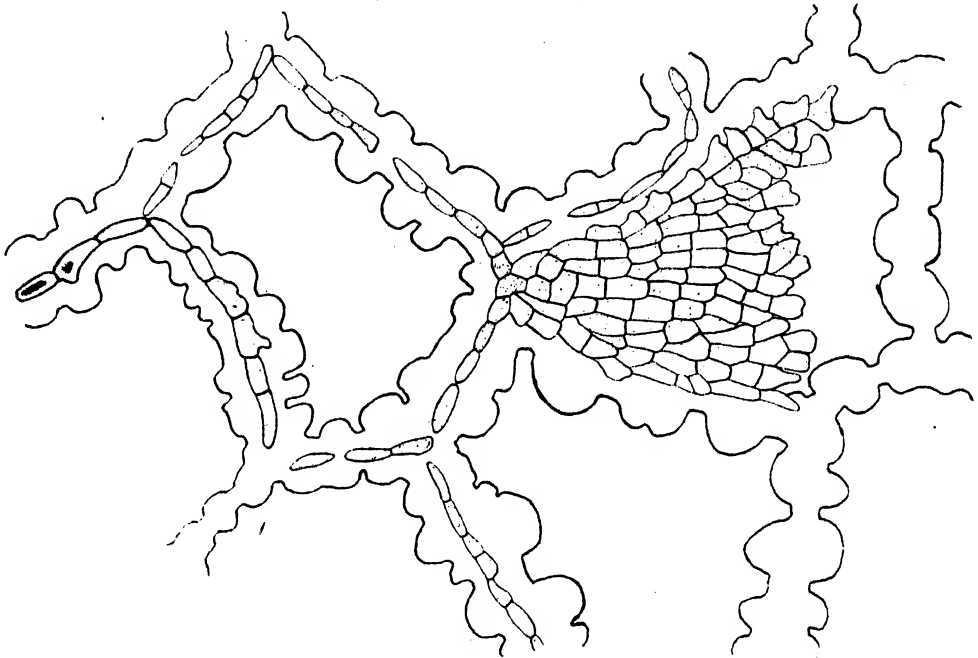


FIG. 2.

around the edge of each plate of mycelium do not penetrate the walls of the host cells, but are limited to the middle lamella and are shown in the figure in surface view. This internal mycelium is shown in Fig. 2 in horizontal section through the subepidermal layer of the host leaf.

At irregular intervals throughout the colony other smaller patches of internal mycelium are formed, usually not penetrating below the subepidermis of the host, and each connected directly through the cuticle with the external mycelium. I have been unable to detect any connection between these scattered plates of internal mycelium and the scattered hyphopodia, which appear to be functionless in this species. In Fig. 3 one of these subsidiary internal mycelia is shown in transverse section, connected directly with a cell of the external mycelium, while in Fig. 4 two plates of internal mycelium are shown originating from terminal cells of external hyphae. The last figure is of especial interest, as it shows

that the external mycelium does not penetrate through the stomatal opening to form its internal connection, but penetrates the cuticle through a groove surrounding each stoma, into the adjacent epidermis. In other cases penetration of the cuticle bears no relation to the stomata of the host leaf.

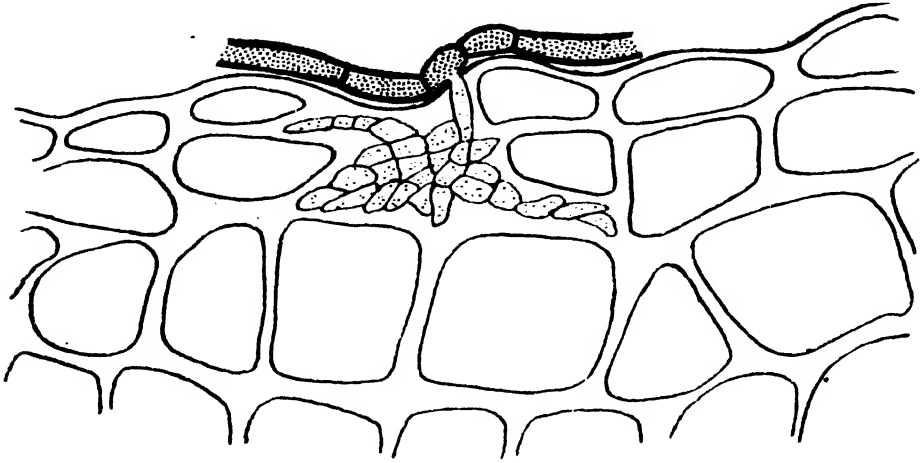


FIG. 3.

In view of the presence of an extensive internal mycelium and of the apparent absence of functional hyphopodia, it seems to the writer preferable to remove this species from the genus *Asterina*, which in our view should be limited to species of true ecto-parasitic habit,

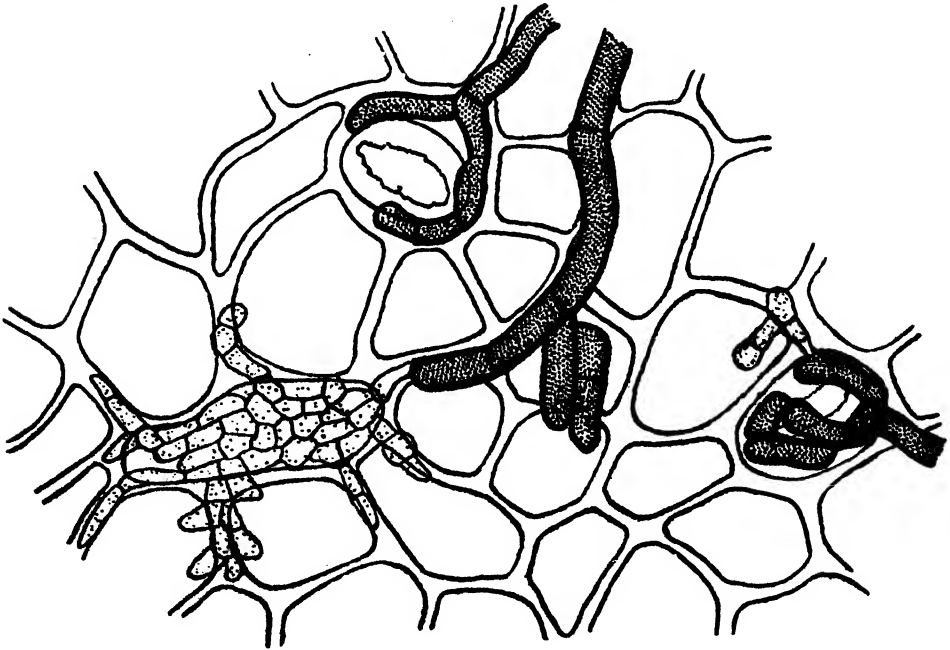


FIG. 4.

possessing hyphopodia and haustoria in epidermis and subepidermis formed singly and exclusively from the hyphopodia. For the present it appears best to return the species to the genus *Asterinella*, in which it was originally placed by Sydow.* This genus contains species with a wide range of internal absorption mechanisms, and at present it is not possible to sort these into separate genera on the basis of habit, with the information now available.

***Asterina inconspicua* Doidge, l.c.**

Each colony of this species, on *Chilianthus arboreus*, shows a dark yellowish-brown to brown central spot in the underlying host tissues. In section this spot (Fig. 5) contains a subcuticular plate of mycelium varying from dark brown in colour in the centre to hyaline

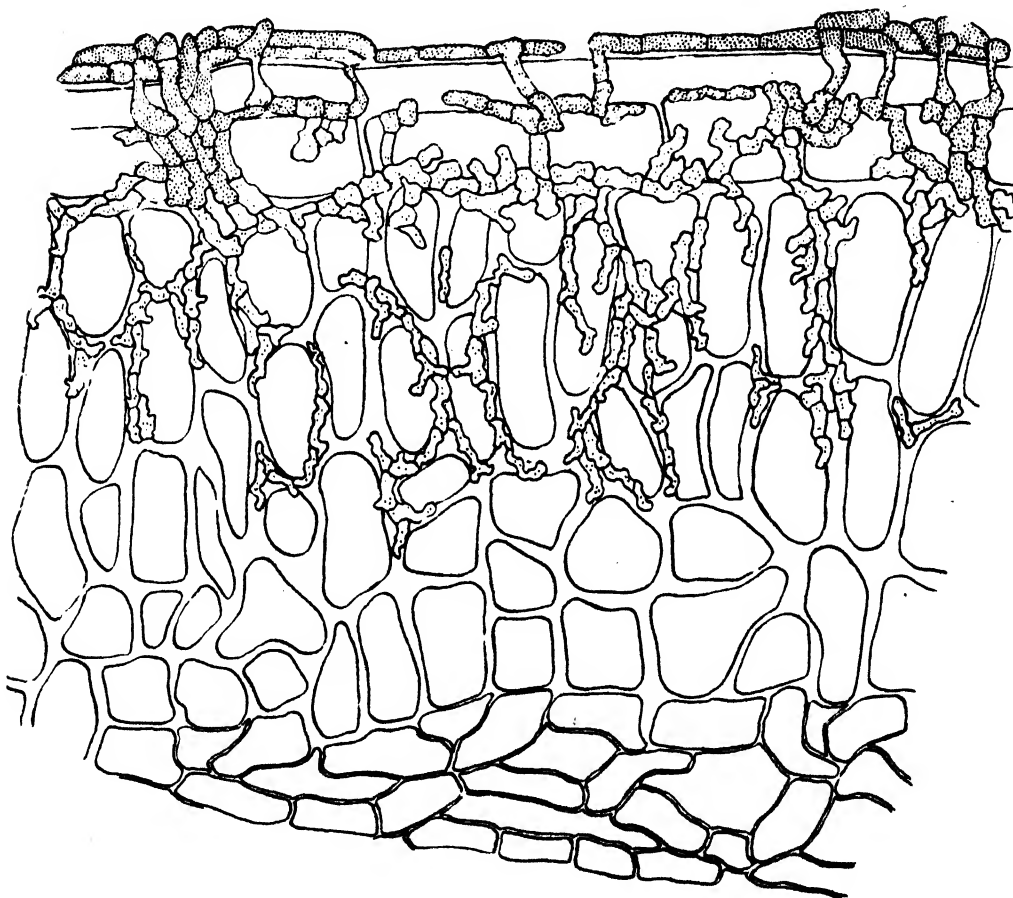


FIG. 5.

around the edges, and connected at frequent intervals directly through the cuticle with the external hyphae, which are closely aggregated in this region and often form almost a solid plate of cells. From the subcuticular layer tortuous, shortly septate hyphae penetrate between the cells of the epidermis and palisade layers of the leaf, and in some old colonies they may almost reach the lower epidermis. The cell walls of the invaded tissue are changed

* Sydow, H., in Ann. Myc. XXII, p. 425, 1924.

chemically so that they stain pink to red with Sudan III, while their contents are partly or completely disorganised and no longer contain visible chloroplasts. The whole internal mycelium is intercellular and no haustoria are produced in the host cells.

At irregularly scattered points over the colony subsidiary penetrations of the host are made, direct through the cuticle. These originate from some of the hyphopodia, which first form a delicate hypha penetrating through the cuticle and spreading over the epidermis underneath. While this is occurring, the hyphae of the external mycelium form a small irregular plate of short branches surrounding the hyphopodium, and at a later stage some of these branches penetrate the cuticle to connect with the enlarging subcuticular mycelium. Early stages in the development of these subsidiary internal connections are shown in Fig. 6, one viewed from the surface of the leaf, and the other from below the epidermis.

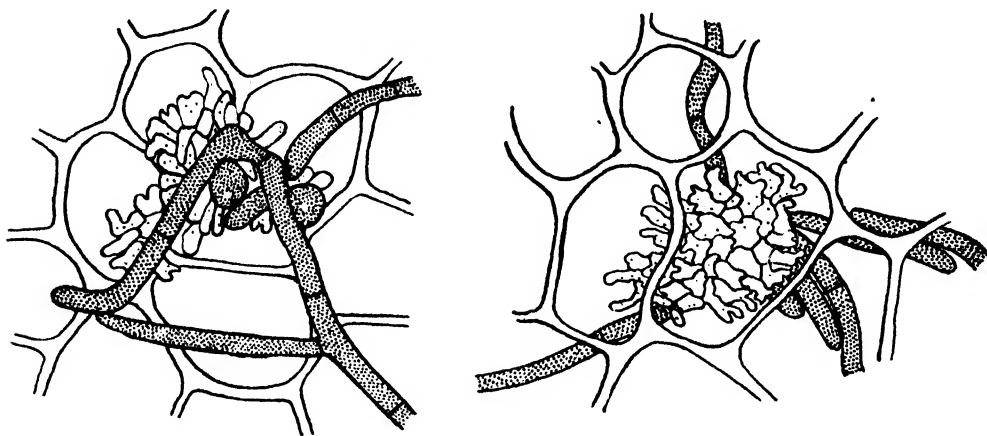


FIG. 6.

In these drawings the internal mycelium is shown lightly shaded, and at these stages is entirely subcuticular and hyaline.

In view of the extensive internal mycelium of this species the writer prefers to remove it from the genus *Asterina*, as *Asterinella inconspicua* (Doidge) comb. n., though it may be regarded as exhibiting a transition towards the true ectoparasitism of *Asterina* in that the hyphopodia become functional late in the development of the colony.

***Asterina secamonicola* Doidge.**

in *Bothalia* II, p. 233, 1927.

As noted by Doidge (l.c., IV, p. 286), the hyphae of the external mycelium are much branched around the scattered hyphopodia, and in mature colonies most of the hyphopodia are surrounded by a close irregular plate of mycelium. (Fig. 7). Viewed from below the epidermis the hyphopodium is seen to have produced a coralloid hyaline haustorium filling the whole upper part of a single epidermal cell (Fig. 8). In transverse section (Fig. 9), the haustorium may either be inside the epidermal cell, more or less adnate to its upper wall, or in other cases apparently external to the epidermal cell and beneath the cuticle. I have been quite unable to detect any other internal absorption apparatus in this species, which is therefore correctly classified as an *Asterina*, and truly ecto-parasitic in habit.

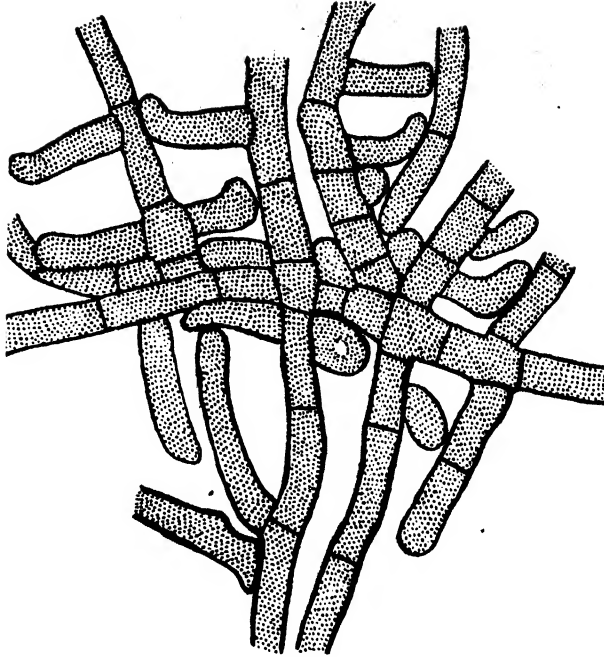


FIG. 7.

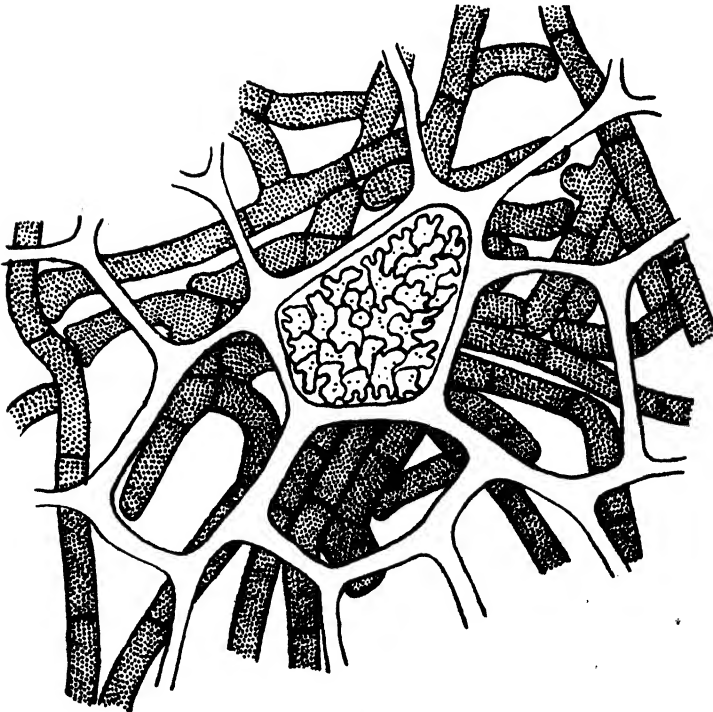


FIG. 8.

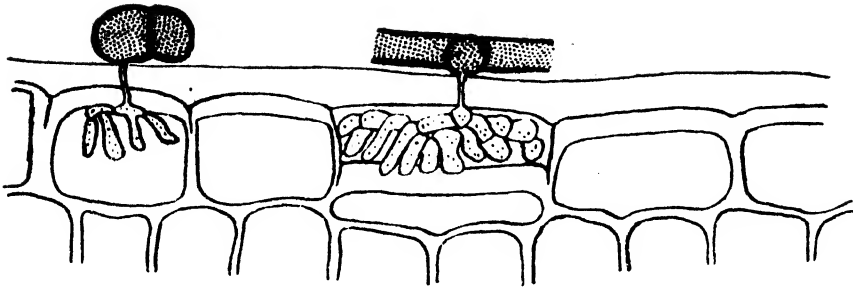


FIG. 9.

***Lembosia piriensis* Doidge.**

in *Bothalia* I, p. 78 (1922).

In this species each of the scattered hyphopodia forms a single coralloid haustorium in the epidermis beneath, at first filling a single cell of the host, but later in some cases extending into one or two adjacent cells. There is no other penetration of the host visible in our preparations, and the fungus is correctly placed in the genus *Lembosia*. Figure 10

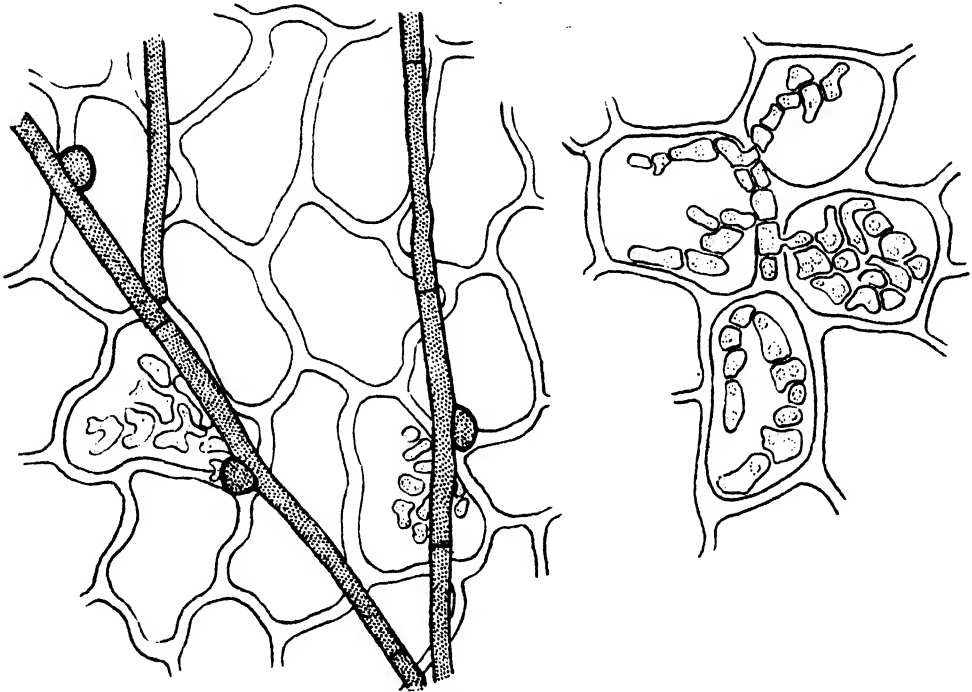


FIG. 10.

shows a surface view of the mycelium with haustoria in the epidermis below, on the right a haustorium extending over four epidermal cells is drawn. Figure 11 shows haustoria and mycelium in an older part of the colony, viewed from below the epidermis, while Fig. 12 shows the haustoria in transverse section.

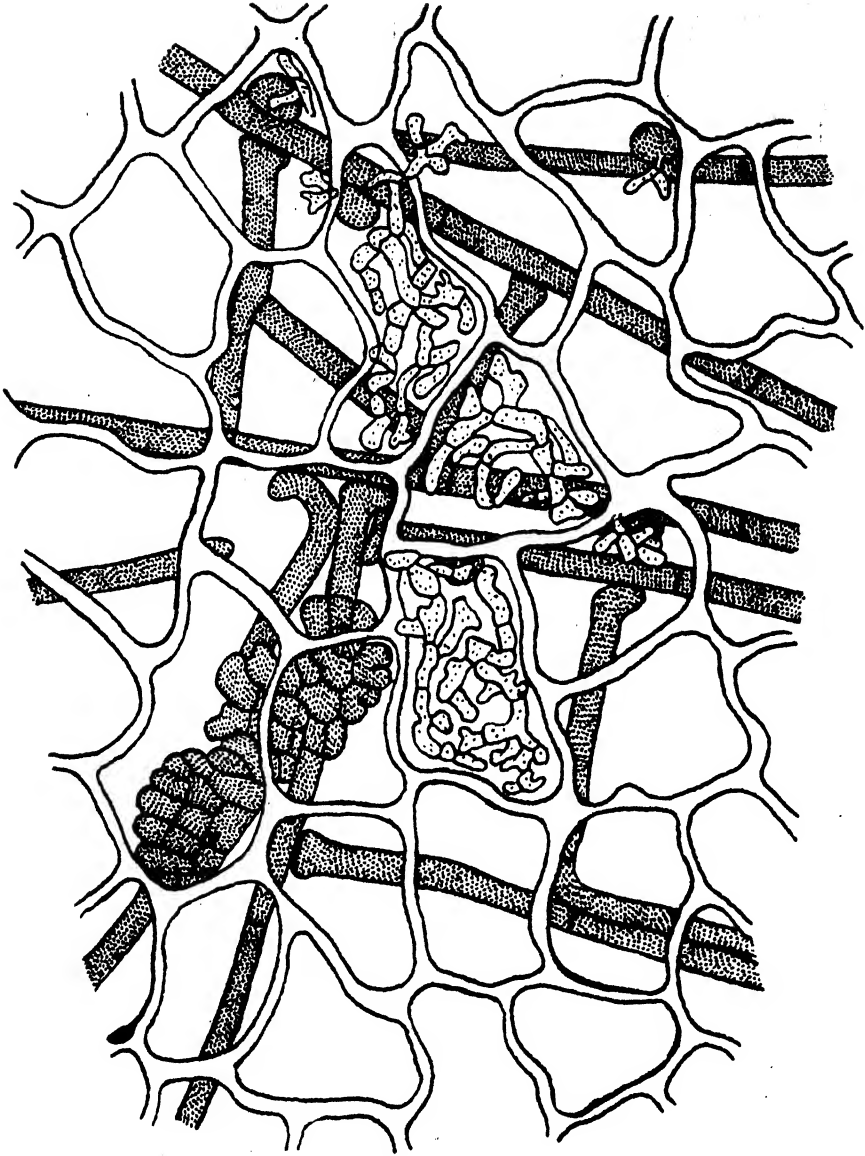


FIG. 11.

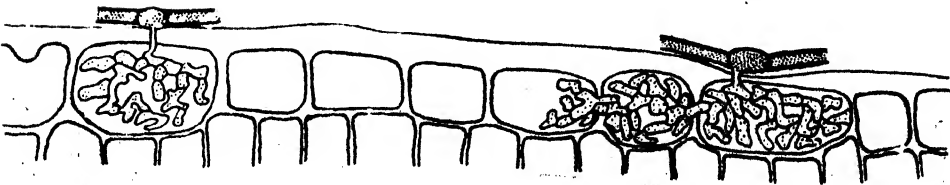


FIG. 12.

Lembosia durbana van der Byl.

in South African Journ. Sci., XXVI, p. 319 (1926).

Beneath the centre of the colony, where the external mycelium is densely aggregated, and from which it radiates outwards more or less regularly, there is an extensive plate of subhyaline to hyaline mycelium beneath the cuticle, connected by fairly numerous pegs direct through the cuticle to the external hyphae. From the subcuticular plate hyphae descend between the cells of the epidermis to form a similar plate of small cells between

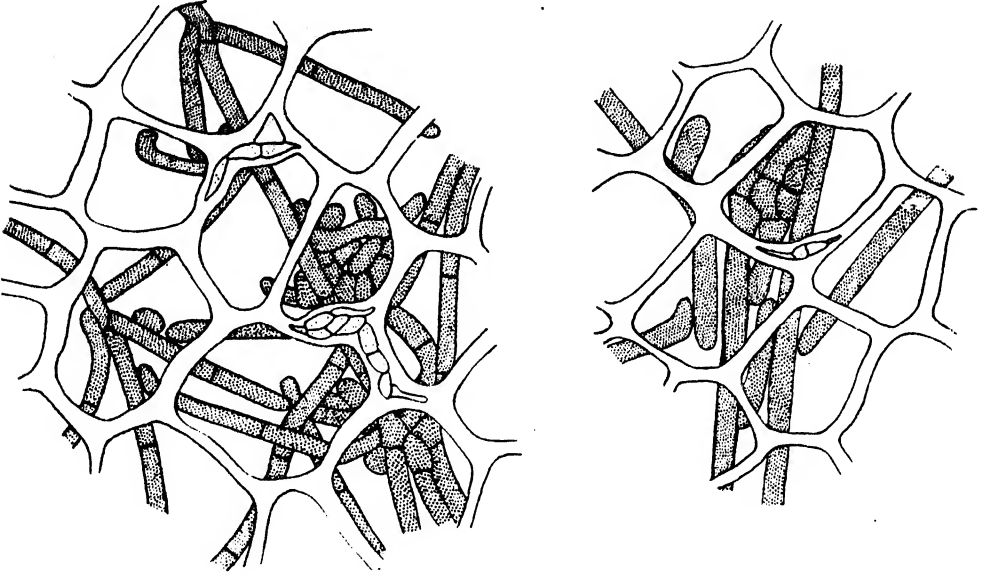


FIG 13.

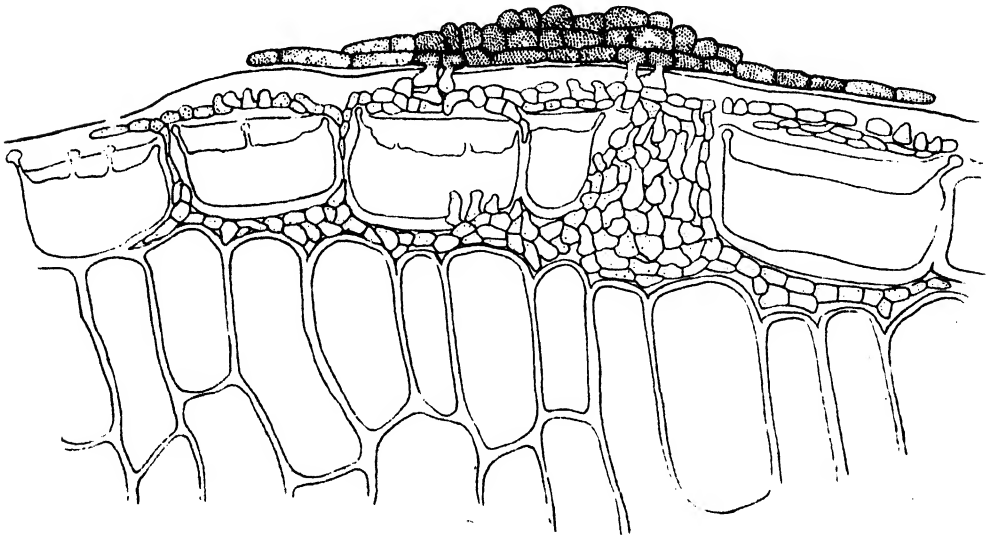


FIG. 14.

the epidermis and palisade layers of the leaf; no deeper penetration of these hyphae has been found. There are no haustoria in the host cells, and the internal mycelium is completely intercellular. At scattered points in other parts of the colony, beneath the mycelial aggregations which surround some of the hyphopodia, smaller patches of internal mycelium are formed, usually without the subcuticular plate but with the hyphae descending between the epidermal cells to form small patches of mycelium above the palisade layer. It is possible that these secondary penetrations of the host originate from the hyphopodia but in our preparations it was not possible to establish this point, as each hyphopodium is surrounded by an irregular plate of mycelial branches, as shown in Fig. 13. The epidermal cells have a series of pits extending up towards the leaf surface, which are omitted from Fig. 13 for the sake of clarity, though shown in transverse section in Fig. 14, cut through the centre of the colony.

The presence of an extensive internal mycelium in this species, in the writer's opinion, removes it from *Lembosia*, and it would be best placed as *Echinodes durbana* (v. d. Byl) comb. n., though it shows transition towards the true ectoparasitism of *Lembosia* and *Asterina*, in so far as the hyphopodia being functional.

SOME SOUTH AFRICAN PESTALOTIA SPECIES.

By Elaine M. Laughton.

Fungi belonging to the genus *Pestalotia*, occurring on indigenous South African host plants, have received slight attention, largely because, thus far, they are not known to be of any great economic importance. On the other hand, some well-known parasitic species of *Pestalotia*, which have been introduced with their hosts, occur wherever the host plant is present abundantly. These fungi may cause extensive damage, particularly in nurseries.

Most of the *Pestalotia* species, of which material is to be found in the Cryptogamic Herbarium at Pretoria, occur on forest trees and shrubs, although some have been collected in coastal scrub or in the open country. The acervuli of these fungi occur on dry leaf areas which are grey, brown or almost white and usually have a well-defined margin. Not infrequently the fungus is associated with other fungi or with injury caused by leaf miners.

On the following pages, species of *Pestalotia* recognised on cultivated and on indigenous plants in South Africa are listed in alphabetical order; descriptions are given of those occurring on indigenous plants.

***Pestalotia Aloës* Trinch.**

Trinchieri, Rend. Accad. Sc., Napoli XLVIII, fasc. 8-12, Extr. p. 8.

Sacc. Syll. Fung. XXII; 1227. du Plessis, S. Afric. Journ. Sci. XXX (1933), 209.

Acervuli rather large, gregarious, veiled by the torn epidermis, sublenticular, black, 171-245 μ diam., 61-122 μ high. Conidia very numerous, fusoid or subpyriform, sometimes curved, 4-septate, not constricted at the septa or very slightly so, 19.5-24.5 \times 4.5-7 μ . The three median cells thicker, fuscous; terminal cells minute, the apical cell bearing three rather long, filiform, divaricate setae, 17-24.5 μ long and 1 μ thick, acute at the apex; basal cell produced into a hyaline pedicel, 4.5-9.5 \times 1 μ .

on *Aloe* spp., leaves, Stellenbosch, du Plessis (Stell. 813), and Dippenaar (Stell. 900).

The above species was recorded by du Plessis (l.c.) on leaves of *Aloe* spp.; unfortunately the specimens quoted are not to be found in the herbarium of the Stellenbosch-Elsenburg College of Agriculture, and it has not been possible to study the fungus nor to make drawings of the spores. The description, taken from the Sylloge Fungorum (l.c.) is included for the sake of completeness. The species was originally described by Trinchieri on dry scapes of *Aloe virens* in southern Italy.

***Pestalotia Burchelliae* Laughton sp. nov.**

Maculae amphigenae, parvae, rotundatae v. majusculae, irregulares, avellaneae, linea brunnea limitatae. Acervuli epiphylli, sparsi, punctiformes, pusilli, 75-150 μ diam., epidermide convexa tecti dein erumpentes. Conidia fusioidea v. clavato-fusioidea, recta v. curvata, 4-septata, vix ad septa constricta, 22-25 μ longa, cellulis tribus mediis 15-17.5 μ longis, 7.5-8 μ latis, infimis olivaceis, duabus superioribus obscurioribus; cellulis extimis hyalinis, apicali obtuse conoidea, 4-5 μ longa, setis 3, raro 4, divergentibus, nonnunquam ramosis, 20-30 μ longis ornata, basali conoidea, 4-5 μ longa, in pedicellum 5-7 μ longum hyalinum abeunte.

Hab. in foliis viventis *Burchelliae bubalinae*, Knysna, leg. F. S. Laughton, 34912.

Leaf spots small, more or less circular, or larger, spreading, avellaneous to wood brown with snuff brown border. Acervuli epiphyllous, minute, black, punctiform, scattered irregularly, 75-150 μ diam., formed under the epidermis which becomes convex over the developing acervulus, ca. 50 μ high, becoming conical when ruptured in the centre.

Conidia fusoid or clavate-fusoid, tapering to the base, straight or curved, 5-celled, 22–25 μ long, very slightly constricted at the septa. The three coloured median cells 15–17.5 \times 7.5–8 μ , rarely 6–7 μ or 8.5–9 μ broad, the two upper buffy-brown to olive brown, the lowest, deep to dark olive buff; the central cell is sometimes the darkest. Basal cell subhyaline, conical, 4–5 μ long, tapering to the pedicel, which is slender, hyaline, straight, 5–7 μ long. Apical cell obtusely conical, 4–5 μ long, hyaline, bearing three, rarely four, widely divergent setae, 20–30 μ long, mostly about 25 μ long, occasionally branched.

on *Burchellia bubalina* (Linn. f.) Sims, common on living leaves at the edge of the forest, Garden of Eden Nature Reserve, Knysna, 6th May, 1945, *F. S. Laughton*, 34912.

This fungus is often associated with insect injury, apparently caused by a "leaf miner."

***Pestalotia caffra* Syd.**

H. and P. Sydow, Ann. Myc. 12 (1914) 266. Guba, Mycologia 24 (1932) 362.

Acervuli amphigenous, mostly epiphyllous, irregularly distributed on rather large, dry leaf spots, which are irregular in outline and greyish white in the centre with a raised snuff-brown border. Acervuli circular in outline, subepidermal, pushing up the epidermis in the form of a cone; then becoming erumpent, surrounded by the torn epidermis, which collapses, the spores being distributed over the matrix in a sooty-looking mass.

Conidia broadly clavate, five-celled, not constricted at the septa, 22–28 μ long; the three central coloured cells 16–19 \times 8–11 μ , the two upper warm sepia, the lowest pale, avellaneous; basal cell subhyaline, conical, 5–6 μ long, tapering to the pedicel, which is erect, 2–7 μ long; apical cell rather short, obtusely conical, bearing three, widely divergent, rather strong setae, 20–26 μ long, 1 μ thick at the point of divergence and tapering to the tips.

on leaves of *Mimusops caffra* E. Mey., Isipingo, *Doidge*, 6630.

***Pestalotia Cassinis* Laughton sp. nov.**

Maculae amphigenae parvae vel majusculae usque 1.5 cm. diam., in pagina folii superiore cinerascens, linea atro-brunnea cinctae, in inferiore dilute brunneae margine rufo-brunneo limitatae. Acervuli amphigeni, plerumque epiphylli, sparsi, atri, punctiformes, primo epidermide conico-elevante tecti dein erumpentes, lenticulares, 250–300 μ diam. Conidia fusioidea, 4-septata, recta, rarius leniter curvata, ad septa haud vel leniter constricta, 20–25 μ longa, cellulis tribus mediis primo pallide olivaceo-brunneis, deinde duabus superioribus paulum obscurioribus, 12.5–15 \times 5.5–7 μ , plerumque 6 μ rare usque 7.5 μ latis, cellula basali conoidea, 3–4 μ longa, in pedicellum brevem 2–8 μ longum abeunte, apicali conoidea setis 3 plus minus divergentibus, 10–20 μ longis coronata.

Hab. in foliis vivis *Cassinis sphaerophyllae*, Brenton, Knysna, leg. E. M. Laughton, 34916.

Leaf spots irregular in outline, small or up to 1.5 cm. diam., often marginal; on the upper side of the leaf smoke-grey or pale smoke-grey, with very narrow blackish brown border, with age the epidermis often becomes wrinkled and papery and breaks away; on the lower side cinnamon drab, with a broader zone of warm sepia at the margin.

Acervuli epiphyllous, occasionally also hypophyllous, scattered, black, punctiform, developing under the epidermis which becomes raised and conical, then ruptures and remains partly veiling the spores. Acervuli lenticular, 250–300 μ diam., 100–200 μ high in the centre.

Conidia fusoid, five-celled, straight, very rarely somewhat curved and inequilateral, not constricted at the septa or very slightly so, 22–25 μ long. The three central coloured cells at first pale to deep olive-buff, concolorous; later the two upper cells are darker, buffy-brown, or the central cell, which is the broadest is also the darkest, buffy-brown, and the uppermost dark olive; coloured cells 12.5–17 \times 5.5–7 μ , mostly 15 \times 6 μ , rarely up to 7.5 μ broad; basal cell hyaline, conical, 3–4 μ long, tapering to the short pedicel, which is 2–8 μ long; apical cell narrow-conical, hyaline, with a crest of three slender setae, 10–20 μ long, mostly ca. 15 μ long, which may be ascending or more or less divergent.

on *Cassine sphaerophylla* O. Ktze., fairly common on living leaves, usually in coastal scrub, Brenton, Knysna, *E. M. Laughton*, 34916; Buffalo Bay Forest, *E. M. Laughton*, 34914.

Pterocelastrus tricuspidatus Sond., Knysna, *E. M. Laughton*, 34915.

***Pestalotia disseminata* Thuem.**

v. Thuemen, Inst. Rev. Sci. Coimbra 28 (1880) 501; Guba, Mycologia 24 (1932) 365.

on *Eucalyptus diversicolor* F. Muell., stems of seedlings, Kruisfontein, *E. M. Laughton*, 34911.

Eucalyptus Lehmanni Preiss., dead leaves, Fort Cunynghamme, *D.F.O.*, 23701.

Eucalyptus sp., dead leaves, Blauwkrantz, Storms River, *D.F.O.*, 11388.

***Pestalotia Encephalartos* Laughton sp. nov.**

Maculae pallide olivaceae ex apice foliolorum late extensae et saepe magnam folioli partem occupantes, margine prominule castaneo- vel atrobrunneo limitatae. Acervuli epiphylli, gregarii, densiuscule dispersi, oblongi, usque 500 μ longi, nonnunquam coalescentes, epidermide elevata diu tecta, demum erumpentes et ea lacerata cincti. Conidia clavata, recta v. leniter curvata, 18–25 μ longa, 4-septata, ad septa leniter constricta; cellulis tribus mediis 12.5–17 \times 6–9 μ , olivaceo-brunneis quarum duabus superioribus obscurioribus vel cellula media tantum obscuriore, cellula basali hyalina conoidea, 4–5 μ longa ad pedicellum rectum v. curvatum 6–7 μ longum attenuata, apicali hyalina obtuse conoidea, breviuscule, setis 3, rarius 2, crassiusculis divaricatis, 17–25 μ longis instructa.

Hab. in foliis *Encephalartos villosi*, Malvern, 861.

Acervuli in rather dense groups on discoloured leaf areas, which usually spread from the tip of the leaflet, extending downwards until the greater part of the whole of the leaflet is involved. These areas are dark olive buff to isabella colour, with a raised border which is snuff-brown or chestnut-brown to blackish-brown.

Acervuli elongated, long covered by the raised epidermis, then erumpent, surrounded and partly veiled by the torn epidermis, oblong, up to 500 μ long, often becoming coalescent.

Conidia straight or slightly curved, 18–25 μ long, 4-septate, slightly constricted at the septa; the three median coloured cells 12.5–17 \times 6–9 μ , the two upper darker, snuff-brown to hister, the lowest avellanus to deep olive-buff, or only the central cell darker; basal cell conical, 4–5 μ long, tapering to the pedicel which is short, straight or curved, ca. 6–7 μ long; apical cell bluntly conical, rather short, delicate, bearing three, rarely two, divergent setae, 17–25 μ long.

on *Encephalartos villosus* (Gaertn.) Lem., leaves, Malvern, 861; Durban, *Pole Evans*, 2131.

Stangeria eriopus Nash, leaves, Mountain Rise, Pietermaritzburg, *Doidge*, 864.

In collections 2031 and 864 most of the conidia appear to be immature; they are uniformly paler and more slender, 5–6 μ broad; only a few typical, mature conidia were seen.

***Pestalotia funerea* Desm.**

Desm., Ann. Sc. Nat. Bot. II, 19 (1843) 335–336. Guba, Phytopath. 19 (1929) 202.

on *Cedrus Deodara* Loud., Cedara, 5172.

Cupressus arizonica Greenl., Ermelo, *District Forest Officer*, 28790.

Cupressus torulosa Don., Estcourt, *Erzleben*, 28535.

Juniperus virginiana Linn., Cedara, 2246.

Juniperus sp., Richmond, *Gordon*, 29920.

Pinus halepensis Mill., without locality, 23216; Fort Cunynghame, 700.

Pestalotia Gossypii Hori.

ex Thuruda, Journ. Plant Protection (1917) 27; Tanaka, Mycologia XI (1919) 154; Sacc. Syll. Fung. XXV; 603.

on *Gossypium* sp., stems, Mbabane, Swaziland, Gov. Vet. Officer, 14646.

Pestalotia Guepini Desm.

Desm. Ann. Sci. Nat. Bot. II, 13 (1840) 182-184.

Coryneum Camelliae Massee, Grev. 20 (1891) 8; Kew Bull. 1898, 106-109.

Pestalotia Karstenii Sacc. & Syd., Sacc. Syll. Fung. XIV: 1030.

Pestalotia inquinans Karst., Hedwigia 30 (1891) 301; Sacc. Syll. Fung. X: 487; not Cooke and Harkness, Grev. 12 (1884) 94.

on *Camellia japonica* Linn., leaves, Paarl, S. J. du Plessis (Stell. 618), 34585.

Pestalotia Laughtonae Doidge sp. nov.

Maculae amphigenae irregulares, 1-2 cm. diam. v. majusculae, in pagina folii superiore avellaneae margine brunnea limitatae, in inferiore obscuriores. Acervuli numerosi, epiphylli, gregarii, atri, punctiformes, subepidermici, lenticulares, 300-550 μ rarius 400-450 μ diam., 100-150 μ alto, epidermidem centro perforatam convexulo elevantes. Conidea ovoidea, recta v. valde inaequilatera seu gibbosa, 4-septata, ad septa haud constricta, 22.5-25 μ longa; cellulis tribus mediis 15-17 \times 9-11 μ plerumque 15 \times 10 μ , infimis dilute brunneis duabus superioribus valde obscurioribus demum opacis, sub-atris; cellula apicali hyalina subcylindracea, setis tribus divergentibus, 20-25 μ longis ornata; basali subhyalina turbinata, pedicello hyalino 5-10 μ longo suffulta.

Hab. in foliis *Cassinis sphaerophyllae*, Knysna, leg. E. M. Laughton, 35145.

Leaf spots irregular in outline, 1-2 cm. diam. or larger, often spreading from the leaf margin; on upper leaf surface avellaneous with raised line at margin, which is Natal brown; on the underside wood-brown, usually without darker margin. Acervuli closely and evenly set over the whole leaf spot, discrete, not coalescent, black, punctiform, erumpent by means of a central pore, which may be more or less round, or become radiating through the formation of three or more cracks, running out from the central pore.

Acervuli epiphyllous, subepidermal, the epidermis becoming raised and slightly conical over the acervulus, later becoming ruptured in the centre. Acervuli lenticular, usually 300-350 μ diam., occasionally 400-450 μ , about 100 μ or up to 150 μ high in the centre.

Conidia ovoid, straight or inequilateral and gibbous, 4-septate, not constricted at the septa, 22.5-25 μ long. The three central coloured cells 15-17.5 \times 9-11 μ , mostly 15 \times 10 μ ; the two upper olive-brown to clove-brown, later opaque and almost black; the lowest drab in colour. Apical cell hyaline, cylindrical, bearing three, rarely two, rigid, widely divergent setae; most commonly these are horizontal and almost at right-angles to the axis of the conidium. Basal cell subhyaline, turbinate. Pedicel hyaline, slender, 4-6 μ long.

on *Cassine sphaerophylla* O. Ktze. Brenton, Knysna, in coastal scrub forest, E. M. Laughton, 35145; often associated with *Pestalotia Cassinis* Laught.

Pterocelstrus tricuspidatus Sond., Knysna, E. M. Laughton, 35146.

Pestalotia Laurophylli Laughton sp. nov.

Maculae amphigenae, majusculae, irregulares, usque 1.5 cm. diam., in pagina folii superiore cinerascens linea brunnea limitatae, in inferiore dilute brunneae. Acervuli sparsi, amphigeni, plerumque epiphylli, atri, punctiformes, 175-300 μ diam., primo epidermide tecti, demum erumpentes. Conidia fusioidea, 4-septata, recta, interdum paululo inaequilatera, ad septa haud constricta, 20-25 μ longa; cellulis tribus mediis 14-17.5 μ longis,

7·5–9 μ latis, rarius usque 10 μ latis, infimis olivaceis, duabus superioribus obscurioribus, subopacis; cellulis extimis hyalinis, apicali sub-cylindracea in setis 2–3, divergentibus, 17·5–25 μ longis abeunte, basali conoidea in pedicellum brevem, 2–10 μ longum desinente.

Hab. in foliis viventis *Laurophylli capensis*, Knysna, leg. E. M. Laughton, 34913.

Leaf spots large, up to 1·5 cm. diam., irregular in outline, on the upper leaf surface pale smoke-grey bordered with clove-brown, on the under-surface Natal brown to olive-brown.

Acervuli scattered, amphigenous, mostly epiphyllous, black, punctiform, 175–300 μ diam., 70–100 μ high in the centre, developing under the epidermis, then erumpent.

Conidia ovoid or broadly ellipsoid, erect, rarely somewhat asymmetrical, 4-septate not constricted at the septa, 20–25 μ long. The three median coloured cells 14–17·5 μ long, 7·5–9 μ , rarely up to 10 μ broad, the two upper bister, thick-walled, semi-opaque, the lowest dark olive-buff. Apical cell hyaline, short, sub-cylindrical, often indistinct, bearing at its extremity 2–3 setae, 17·5–25 μ long, rather stout, ca. 1 μ thick at the base and tapering somewhat upwards, two setae oppositely divergent, the third, when present, often vertical. Basal cell subhyaline, tapering downwards to the hyaline pedicel, which is 2–10 μ long, usually ca. 7 μ long.

on *Laurophyllus capensis* Thunb., common on living leaves at the edge of the forest or in the "fynbos", Garden of Eden Nature Reserve, Knysna, 6th May, 1945, E. M. Laughton, 34913.

***Pestalotia macrochaeta* (Speg.) Guba.**

Guba, Mycologia 24 (1932) 369.

Pestalotia funerea Desm. var. *macrochaeta* Speg. Anal. Mus. Nac. Buenos Aires 111 (1911), 412. Sacc. Syll. Fung. XXII: 1226.

on *Pinus caribaea* Morelet, Dukuduku, District Forest Officer, 27660.

Pinus patula Schiede, Spitzkop, Cape, District Forest Officer, 30447, 32073.

Pinus pinaster Ait., Cedara, Fisher, 2100.

Pinus radiata Don., Zwartkop, Hayter, 7767.

Pinus spp. undet., Komgha, Crewe, 27812; Maritzburg, Kelly, 11868.

***Pestalotia Mangiferae* P. Henn.**

P. Hennings, Ann. Mus. Congo Belge V, Fasc. 11 (1907) 120.

Sacc. Syll. Fung. 22: 1223; Mundkur and Kheswalla, Mycologia 34 (1942), 309.

Pestalotia funerea Desm. forma *Mangiferae* Saccardo, Atti Istit. Veneto Sci. VI, c (1884) 461.

Pestalotia virgatula Kleb., Mykol. Zentralblatt 4 (1914) 13; Guba, Phytopath. 19 (1929), 222.

Pestalotia pauciseta Syd. (nec. Sacc.) Ann. Myc. 15 (1917), 262.

on living leaves of *Mangifera indica* Linn., Barberton, 1911.

***Pestalotia Micheneri* Guba.**

Guba, Mycologia 24 (1932), 371.

on leaves of *Araucaria Cunninghamii* Sweet, Eshowe, District Forest Officer, 15461.

***Pestalotia Milletiae* Laughton sp. nov.**

Maculae utrinque conspicuae, rotundatae sparsae, quoad magnitudinem variabiles vel e margine vel ex apice foliolorum late extensae et saepe dimidiam folioli partem occupantes, albescentes, margine atrobrunneo limitatae. Acervuli epiphylli irregulariter sparsi, puncti-

formes, rotundati v. elliptici, primo epidermide et hypodermide tecti dein erumpentes, 200–400 μ diam. Conidia ellipsoidea, 19–22 μ longa, 4-septata, haud vel vix constricta, recta v. leniter curvata, cellulis tribus mediis $14-17.5 \times 7-8 \mu$, olivaceo-brunneis quarum duabus superioribus obscurioribus; cellula basali conoidea, subhyalina 2–3 μ longa in pedicellum tenuem erectum 4–5 μ longum attenuata; apicali hyalina obtuse conoidea, setis 2–3 tenuibus 10–15 μ longis ornata.

Hab. in foliis viventis *Milletiae* sp., in sylvis, Eshowe, Zululand, leg. E. M. Laughton, 33437.

On leaf spots, visible on both sides of the leaf, whitish-brown (nearest pale olive-buff) with clove-brown to black margin; the leaf spots may be scattered, more or less circular in outline, and variable in size, or, spreading from the margin or apex of the leaflet, cover larger areas, involving up to half the surface of the leaflet.

Acervuli epiphyllous, irregularly scattered, punctiform, round to elliptical in outline, 200–400 μ diam., developing under epidermis and hypodermis, then erumpent, or pseudopycnidial and up to 300 μ deep.

Conidia ellipsoid, straight or slightly curved, 19–22 μ long, 4-septate, not constricted at the septa, or barely so; the three median coloured cells $14-17.5 \times 7-8 \mu$, the two upper rather darker than the lowest, or frequently the central cell, which is the broadest, is also the darkest in colour (olive-brown), the uppermost slightly paler and the lowest the palest (buffy-brown to deep olive-buff). Basal cell conical, subhyaline, 2–3 μ long, tapering into a slender, erect pedicel 4–5 μ long. Apical cell bluntly conical, hyaline, bearing 2–3 slender, delicate setae, 10–15 μ long.

on *Milletiae* sp., probably *Milletia Sutherlandi* Harv., living leaves, Eshowe Forest, Zululand, E. M. Laughton, 33437.

***Pestalotia neglecta* Thuem.**

v. Thuemen, Inst. Rev. Sci. Coimbra II, 27 (1880), 386.

Sacc. Syll. Fung. III: 788. Guba, Mycologia 24 (1932), 375.

Pestalotia funerea Desm. var. *Euonymi-japonici* Thuemen Myc. Univ. 884 (1887) nom. nud.

on leaf spots on green leaves of *Euonymus japonica* Linn. f., Johannesburg, Walter Webber, 34922. Associated with other fungi.

***Pestalotia Ocoteae* Laughton sp. nov.**

Maculae fructicolae, sparsae, luteo-brunneae, margine atro limitatae vel effusae saepe totam fructus superficiem occupantes. Acervuli sparsi, minuti, primitus epidermide conico-elevata tecti, demum erumpentes et ea fissa cincti, rotundati v. elongati, 240–275 μ diam. Conidia fusioidea, recta v. leniter curvata, 4-septata, ad septa haud vel vix constricta, 22.5–27.5 μ longa, cellulis tribus mediis 15–18 μ longis, olivaceis, duabus superioribus leniter obscurioribus; cellulis extimis hyalinis conoideis, apicali setulis 2–3 divaricatis tenuibus 15–25 μ longis ornata, basali 3–4 μ longa in pedicellum brevem rectum v. curvatum 5–7 μ longum desinente.

Hab. in fructibus immaturis *Ocoteae bullata*, in sylvis, Deepwells, Knysna, leg. J. F. V. Phillips, 17824.

Acervuli developing on discoloured areas on the fruit, which are either few, scattered, buffy-brown with dark brown or black border, or effuse, the whole epicarp becoming discoloured buffy-brown.

Acervuli scattered, subepidermal, then erumpent, round or somewhat elongated, 240–275 μ diam., up to 100 μ high in the centre. The epicarp of the fruit has a thick cuticle, 10–15 μ thick, and below the epidermis a layer of sclerenchyma. Acervuli develop between the sclerenchyma and the epidermis, causing a conical elevation of the latter. The increasing pressure of the developing spores ruptures the epidermis, which remains surrounding and partly veiling the acervuli.

Conidia fusoid, straight or slightly curved, 4-septate, $22.5-27.5\ \mu$ long, not constricted at the septa or slightly so, but older spores may be more deeply constricted. The three central coloured cells are $15-18 \times 6-7.5\ \mu$, the two upper buffy-brown, the lowest somewhat paler. Terminal cells hyaline, conical, the apical cell bearing 2-3, usually 3, slender, hyaline, divaricate setae $15-25\ \mu$ long; basal cell $3-4\ \mu$ long, tapering into a short pedicel, which is straight or curved, $5-7\ \mu$ long.

on immature fruits of *Ocotea bullata* E. Mey. (Stinkwood) Deepwalls Forest, Knysna, J. F. V. Phillips, 17824.

***Pestalotia palmarum* Cooke.**

Cooke, *Grevillea* 3 (1875), 115 and 4 (1876), 102.

Guba, *Phytopath*, 19 (1929), 210.

on *Cocos nucifera* Linn., leaves, Lourenco Marques, *Hardenburg*, 22559; on fruit, Inhaci Is., *Mogg*, 34154.

Phoenix reclinata Jacq., Lourenco Marques, *Howard*, 487.

***Pestalotia Pelargonii* Laughton sp. nov.**

Maculae sparsae, rotundatae, usque 5 mm. diam., in pagina folii superiore cinerascetes, margine avellaneo limitatae, inferiore tomentosa obscurae. Acervuli hypophylli, sparsi, punctiformes, aeterrimi, usque $250\ \mu$ diam., primum epidermide tecti dein erumpentes. Conidia ellipsoidea v. ovoidea, 4-septata, recta raro inaequilatera, ad septa haud constricta, $20-25\ \mu$ longa; cellulis tribus mediis $14-17.5 \times 7.5-9.5\ \mu$, infimis olivaceis, duabus superioribus obscurioribus, semiopacis; cellula apicali hyalina conoidea, setis 2-4 plerumque 3 divergentibus ornata, basali brevi in pedicellum $5-7\ \mu$ longum abeunte.

Hab. in foliis viventis *Pelargonii cordati*, Knysna, leg. E. M. Laughton, 34918.

Leaf spots scattered, more or less circular in outline, often small, up to 5 mm. diam.; on the upper surface of the leaf smoke-grey with avellaneous border, indistinct on the underside where they are obscured by the thick tomentum on the leaf surface.

Acervuli hypophyllous, irregularly scattered, punctiform, subepidermal, lenticular, up to $250\ \mu$ diam.; spores developing in great numbers push up the epidermis in the form of a cone, $90-125\ \mu$ high in the centre; the epidermis ruptures over the centre of the acervulus and the masses of dark conidia which emerge lodge amongst the long curved hairs which form the tomentum on the lower leaf surface.

Conidia ellipsoid to ovoid, 4-septate, straight, rarely inequilateral, not constricted at the septa, $20-25\ \mu$ long. The three median coloured cells cask-shaped, $14-17.5 \times 7.5-9.5\ \mu$, the two upper olive-brown, semi-opaque, the lowest dark olive-buff. Apical cell hyaline, conical, bearing two to four, usually three, divergent setae, $15-25\ \mu$ long. Basal cell rather short, tapering to a straight pedicel $5-7\ \mu$ long.

on *Pelargonium cordatum* L'Hérit., on living leaves at the edge of the forest or in the "fynbos", Garden of Eden Nature Reserve, Knysna, 14th May, 1945, E. M. Laughton, 34918.

***Pestalotia Podocarpi* Laughton sp. nov.**

Maculae albescentes vel avellanae ex apice foliorum late extensae usque 5 cm. longae, margine prominulo infuscato limitatae. Acervuli epiphylli sparsi v. gregarii nonnunquam coalescentes, majusculi, rotundati v. elliptici, $250-500\ \mu$ diam., primo epidermide tecti convexi, usque $170\ \mu$ alti, demum erumpentes epidermide fissa cincti. Conidia ovoidea v. late fusoido-ellipsoidea, saepe inaequilatera seu gibbosa, $20-23\ \mu$ longa rarius usque $25\ \mu$ longa, ad septa haud vel vix constricta, cellulis tribus mediis 15 (rare 16) $\times 7.5-10\ \mu$, infimis olivaceis duabus superioribus obscurioribus subopacis, cellulis extimis hyalinis, basali late conoidea, $2-5-4\ \mu$ longa, in pedicellum $3-5-7\ \mu$ longum producta, apicali obtuse conoidea, setis 3-4, raro 5, $20-30\ \mu$ longis divergentibus coronata.

Hab. in foliis vivis *Podocarpi latifolii*, Knysna, leg. E. M. Laughton, 34917.

Acervuli seated on dead areas of leaves, almost white to avellaneous on the upper surface, darker on the underside, with a border of mummy-brown separating them from the living green tissues. These dead areas usually spread from the tips of the leaves and are up to 5 cm. long; marginal lesions also occur.

Acervuli epiphyllous, scattered or rather closely set and sometimes coalescing, rather large, circular or elliptic in outline, subepidermal, finally erumpent by a longitudinal slit in the epidermis; in the centre the ruptured epidermis shows white against the dark brown of the covered spore masses. Acervuli 250–500 μ diam., shallow, at first covered by the epidermis, which becomes raised and convex, ca. 75–100 μ high in the centre.

Conidia ovoid or broadly fusoid-ellipsoid, often asymmetrical and distinctly dorsiventral, 20–23 μ long, rarely up to 25 μ long, four-septate, not constricted at the septa, or very slightly so. The three median coloured cells 15 (rarely 16) \times 7.5–10 μ , the two upper bister, rather thick-walled, subopaque, the lowest deep olive-buff. Basal cell conical, 2.5–4 μ long, tapering to the pedicel, which is slender, hyaline, straight, 3.5–7 μ long. Apical cell hyaline, obtusely conical, 4–5 μ long, crowned with 3–4, rarely 5, fairly stout, divergent setae, 20–30 μ long, ca. 1 μ thick at the point of divergence.

on *Podocarpus latifolius* R. Br., on living leaves, common, Garden of Eden Nature Reserve, Knysna, E. M. Laughton, 34917.

Pestalotia Psidii Pat.

Patouillard in Bull. Soc. Myc. Fr. 8 (1892), 136, nom. nud.; Bull. Soc. Myc. Fr. 11 (1895), 232.

Sacc. Syll. Fung. XIV: 1025. Guba, Mycologia 24 (1932), 379.

on fruits of *Psidium Guajava* Linn., Mataffin, Hall and Sons, 34090.

Pestalotia Pterocelastri Laughton sp. nov.

Maculae amphigenae, rotundatae vel irregulares, 5–10 mm. diam., interdum majores, in pagina folii superiore cinerascens margine olivaceo-brunneo limitatae, in inferiore olivaceo-brunneae. Acervuli epiphylli, numerosi, gregarii lenticulares, 200–350 μ diam., 120–165 μ alti, epidermidem centro perforatam convexule elevantes. Conidea fusioidea, 4-septata, basim versus attenuata, interdum curvula v. inaequilatera, ad septa haud vel vix constricta, 25–37.5 μ longa; cellulis tribus mediis 20–25 \times 9–10 μ , infimis pallide olivaceis, duabus superioribus paulum obscurioribus, cellulis extremis prominentibus, basali anguste conoidea, subhyalina, 6–7.5 μ longa in pedicellum hyalinum 5–10 μ longum desinente, apicali cylindracea, ca. 5 μ longa, setis tribus hyalinis basi crassiusculis sursum attenuatis flexuosis 20–44 μ plerumque ca. 30 μ longis coronata.

Hab. in foliis *Pterocelastri tricuspidati*, Knysna, leg. E. M. Laughton, 35143.

Leaf spots round to irregular, 5–10 mm. diam. or larger, smoke-grey on the upper side of the leaf, with raised margin which is buffy-brown to olive-brown; wood-brown on the under side.

Acervuli epiphyllous, numerous, gregarious, lenticular, at first covered by the slightly convex epidermis, sometimes small, but usually larger when mature, 200–350 μ diam., 120–165 μ high in the centre; the epidermis ruptures in the centre, forming a pore which is usually round but sometimes elongated or angular; black, sooty masses of spores emerging spread over the matrix.

Conidia 4-septate, long fusoid, tapering to the base, straight or slightly curved and inequilateral, not constricted at the septa or slightly so, 25–37.5 μ long, often 30–34 μ long. Median cells guttulate, the two upper buffy-brown, the lowest olivaceous, 20–25 \times 9–10 μ . End cells rather large; the apical cell cylindrical ca. 5 μ long, bearing a crest of three or sometimes two, long, flexuous setae 20–44 μ long, mostly ca. 30 μ long, ca. 1.5 μ thick at the base and tapering upwards; basal cell subhyaline, narrow conical, 6–7.5 μ long, tapering into a slender pedicel 5–10 μ long.

on leaves of *Pterocelastus tricuspidatus* Sond., on young trees in the "fynbos" on the southern slope of the town hill, Knysna, E. M. Laughton, 35146.

This species is often associated on the same leaves, and even on the same leaf spots with *Leptosphaeria Pteroclastri* Doidge; *Pestalotia Cassinis* Laughton and *P. Laughtonae* Doidge are also to be found on leaves of *Pteroclastrus tricuspidatus* in the same collection.

Pestalotia Pteroclastri is very similar to *P. Planimi* Vize, which occurs, associated with other fungi, on weathered leaves of another plant belonging to the Celastraceae, *Euonymus japonicus* Linn., in California and in Portugal [Guba, *Mycologia* 24 (1932) p. 377.]

It differs in the form of the acervuli, which are lenticular and not subglobose and in the frequently slightly curved and asymmetrical conidia. Conidia of *P. Planimi* are described and figured as straight, erect. Setae in *P. Planimi* are figured as thick throughout, slightly distended at the tips; those of *P. Pteroclastri* are thick at the base, tapering upwards and becoming slender near the tips.

***Pestalotia quercina* Guba.**

Guba, *Mycologia*, 24 (1932), 379.

on *Quercus* sp., on old weathered leaves of seedlings, Irene, Doidge, 2270, 2271.

***Pestalotia Rapanae* Laughton sp. nov.**

Maculae sparsae, usque 1.5 cm. diam., rotundatae v. irregulares, cinerascens, margine olivaceo-brunneo limitatae. Acervuli epiphylli, sparsa, subepidermici, rotundati, 175–210 μ diam., Conidia ovoidea v. late fusoido-ellipsoidea, saepe inaequilatera, 22–27.5 μ longa, 4-septata, ad septa haud constricta; cellulis tribus mediis 15–19 \times 9–10 μ , brunneis, subopacis, quarum 2 superioribus obscurioribus et majusculis, extimis hyalinis, basali conoidea ca. 4 μ longa, in pedicellum rectum v. leniter curvatum 4–5 μ longum producta, apicali brevi cylindracea v. obtuse conoidea, setis 2–3, plerumque 3, rectis, divergentibus, 15–26.5 μ longis ornata.

Hab. in foliis viventis *Rapanae melanophleos*, Storms River, leg. Doidge, 17171.

Acervuli on dead, discoloured areas of the leaf, which are often near leaf margins, smoke-grey to light drab in the centre with olive-brown border, more or less circular except near the margin of the leaf, where they are irregular, up to 1.5 cm. diam.

Acervuli epiphyllous, scattered, more or less circular in outline, subepidermal, 175–210 μ diam.

Conidia ovoid or broadly fusoid-ellipsoid, often asymmetrical with one side almost straight and the other convex, 22–27.5 μ long, 4-septate, not constricted at the septa. Central coloured cells 15–19 \times 9–10 μ ; the two upper larger, clove-brown, subopaque, the lowest paler, buffy-brown. Extreme cells hyaline; apical cell short, often rather indistinct, cylindrical or truncate conical, bearing at its extremity 2–3, mostly 3, usually straight, divergent setae, 15–26.5 μ long, two of which often form a very wide angle; basal cell conical, about 4 μ long, tapering to a short pedicel, which is hyaline, straight or slightly curved, 4–5 μ long.

on living leaves of *Rapanae melanophleos* Mez., Storms River, Humansdorp District, Doidge, 17171; Garden of Eden, Knysna, E. M. Laughton, 34433, 34911.

***Pestalotia Trichocladi* Laughton sp. nov.**

Maculae effusae, fuscae, indeterminatae. Acervuli epiphylli, minuti, sparsi, rotundati v. leniter elongatae, primum epidermide tecti dein erumpentes epidermide fissa cineti et subvelati, 175–250 μ diam., centro 75–85 μ alti. Conidia fusoida, recta v. subcurvata, 4-septata, ad septa leniter constricta, 30–37.5 μ longa, cellulis tribus mediis brunneis, aequaliter coloratis vel duabus superioribus leniter obscurioribus, 20–25 \times 7.5–9 μ , cellula basali conoidea v. turbinata, subhyalina 4–6 μ longa in pedicellum hyalinum 6–12 μ longum attenuata, apicali hyalina cylindracea, 5–7.5 μ longa, setis 2–4, plerumque 3, 45–60 μ longis, late divergentibus ornata.

Hab. in foliis viventis *Trichocladi criniti*, in sylvis, Storms River, leg. Doidge, 17169.

Acervuli epiphyllous, on large, indeterminate, discoloured areas, which are usually marginal or along the midrib of the leaf. Acervuli minute, scattered, circular to elliptic in outline, developing under the epidermis, which ruptures and remains surrounding and partly veiling the mass of spores, 175–250 μ diam., 75–85 μ high in the centre.

Conidia fusoid, straight or slightly curved, tapering towards the base, 4-septate, 32–37.5 μ long, slightly constricted at the septa. The three median coloured cells buffy-brown, rather thick-walled, equally coloured, or the lowest slightly paler, 20–25 \times 7.5–9 μ . Basal cell conical or turbinate, straight or curved, 4–6 μ long, slightly tinted, olive-buff, tapering downwards into the erect pedicel, which is hyaline, 6–12 μ long. Apical cell hyaline, cylindrical, 5–7.5 μ long, bearing 2–4, usually 3, rather stout, widely divergent setae, 45–60 μ long, ca. 1.25 μ thick at the point of divergence and tapering towards the tips.

on living leaves of *Trichocladus crinitus* Pers., Storms River, *Doidge*, 17169 and *D. J. le Roux*, 34307.

***Pestalotia Watsoniae* Verw. et Dipp.**

Verwoerd and Dippenaar, S. Afric. Journ. Sci. 27 (1930), 327.

Leaf spots round to elliptic in outline, 4–7 mm. diam. or spreading irregularly, especially along the leaf margins, vinaceous buff in the centre, becoming paler with age, margin darker, army-brown to sorghum-brown.

Acervuli amphigenous, black, punctiform, scattered, deeply immersed in the mesophyll of the leaf, then erumpent, cupulate, 120–150 μ diam., 120–200 μ deep, the more shallow acervuli being situated over a vein.

Conidia ellipsoid or ovoid, occasionally asymmetrical, 17.5–22.5 μ long, 3-septate, not constricted at the septa or slightly so. The two median coloured cells at first dark olive-buff then buffy-brown, 12.5–16 \times 7.5–9 μ , thick-walled, wall 1–1.5 μ thick, equally coloured, and approximately equal in size. Basal cell subhyaline, conical, 2.5–4 μ long, tapering into a pedicel which is deciduous, hyaline, delicate, ca. 1.5 μ thick and up to 30 μ long. Apical cell hyaline, delicate, obtusely conical; setae usually 4–5, occasionally 3, rarely 2, hyaline, widely divergent, sometimes branched, 15–30 μ long.

on leaves of *Watsonia rosea* Ker. var. *alba*, Bot. Gard., University of Stellenbosch, *Verwoerd* (Stell. 931), 34586.

***Pestalotia Zahlbruckneriana* P. Henn.**

in A. Zahlbruckner, *Plantae Pentheriana*, Ann. K. K. Naturhist. Hofmus. Wien 15 (1900) 3. Sacc. Syll. Fung. XVI: 1017.

Acervuli epiphyllous, scattered or sub-gregarious, at first pulvinate, covered by the pale or greyish epidermis, then erumpent, black, 0.5–1 mm. diam.

Conidia clavate-fusoid, straight or curved, 4-septate, 17–20 μ long, 6–8 μ broad. The three median, coloured cells olivaceous or fusco-olivaceous. Extreme cells hyaline, papilliform, the apical cell bearing 3 setae, which are hyaline, 15–21 μ long and 0.5 μ thick. Pedicel hyaline, 8–15 μ long and 1–1.5 μ thick.

on the inflorescence of *Strelitzia parvifolia* Dryand, Port Alfred (Kowie), *Penther* 1610.

The type of this species has not been seen and there is no other record of a *Pestalotia* occurring on *Strelitzia* in South Africa; the above description has been taken from that of Hennings in the *Plantae Pentheriana*. He states that *Pestalotia Zahlbruckneriana* is closely related to *P. palmarum* Cooke, but is quite distinct from that species.

SPECIES EXCLUDENDA.

***Pestalotia Evansii* P. Henn.**

P. Hennings, Engl. bot. Jahrb. 41 (1908) 273. Sacc. Syll. Fung. XXII: 1222.

The type of this fungus was collected on *Syzygium cordatum* Hochst. at Barberton by Dr. Pole Evans (No. 234); it has 2-celled, brown spores with 2–4 hyaline, flexuose cilia

at the apex, and is identical with *Neobarclaya natalensis* Syd., on the same host (Durban, *Medley Wood* 6446, 374).

To Mr. E. W. Mason, of the Imperial Mycological Institute, I am indebted for comparing the type of the latter fungus with that of *Neobarclaya congesta* (Berk. & Br.) Petch, which occurs on *Eugenia Jambolana* in Ceylon. He states that there can be no doubt that they are the same. The spores are very variable, from narrow clavate to broadly oval, and show a total variation of $18-30 \times 7-12 \mu$.

The synonymy is as follows :—

Neobarclaya congesta (Berk & Br.) Petch.

Petch, Ann. Roy. Bot. Gard. Peradeniya IX (1924) 165.

Pestalotia congesta Berk & Broome, Journ. Linn. Soc. Lond. XIV (1875), 89.

Neobarclaya natalensis Did, Hedwigia 38 (1899) p. (134).

Pestalotia Evansii P. Henn., Engl. Bot. Jahrb. 41 (1908), 273.

on *Syzygium cordatum* Hochst. (= *Eugenia cordata* Laws.) Durban, *Medley Wood* 6446, 374, 9476 ; Barberton, *Pole Evans*, 234, 1152, *Doidge*, 2009 ; Nelspruit, *Pole Evans*, 11024 ; Eshowe, *McCleun*, 33092.

Grateful acknowledgements are due to Dr. E. M. Doidge, Principal Plant Pathologist, for her assistance, and to the Chief, Division of Botany and Plant Pathology for the loan of specimens from the Cryptogamic Herbarium in Pretoria.

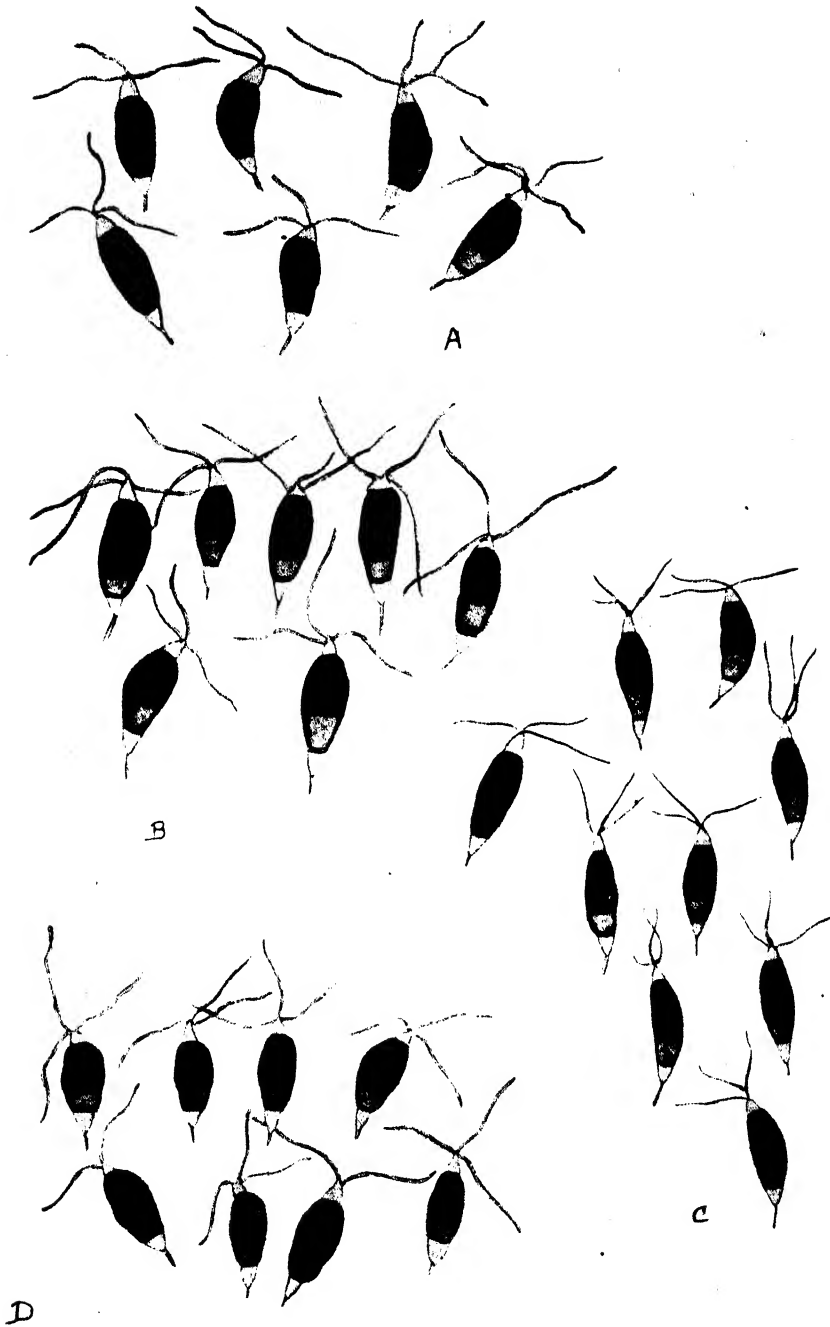


Plate I.—Conidia of : (a) *Pestalotia Burchelliae*; (b) *P. caffra*; (c) *P. Cassinis* on *Cassine*; (d) *P. Encaphalartos*.

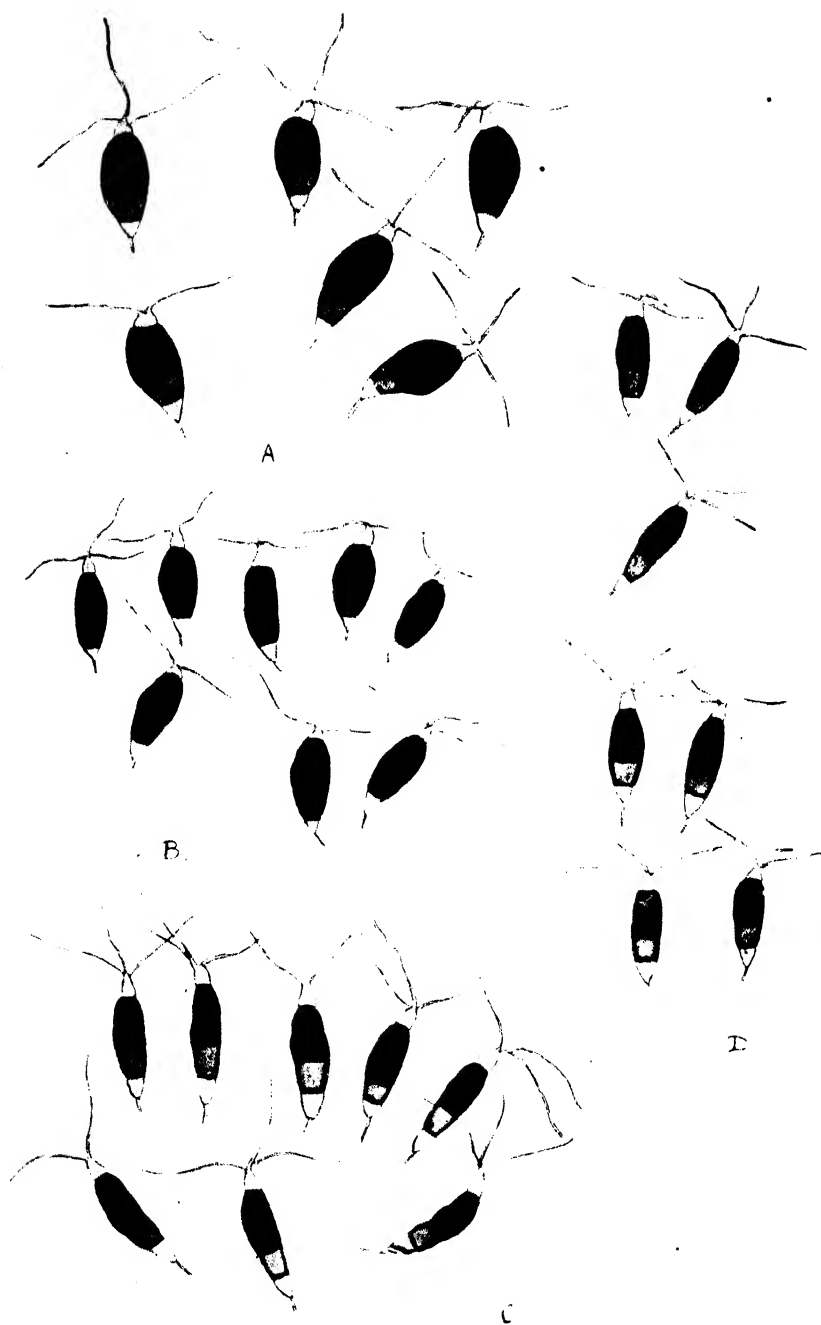


Plate II.—Conidia of: (a) *Pestalotia Laurophylli*; (b) *P. Milletiae*; (c) *P. Ocolear*; (d) *P. Cassinis* on *Pterocelastrus*.

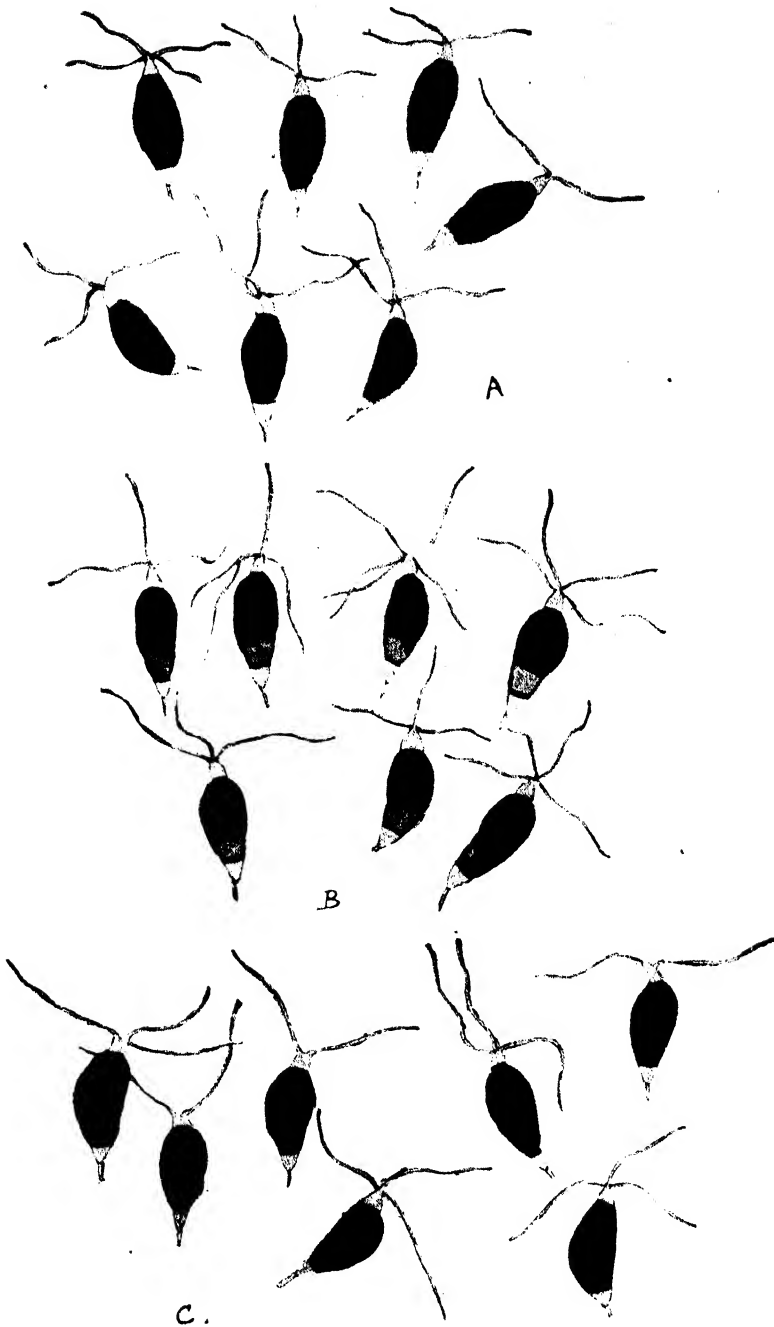


Plate III.—Conidia of: (a) *Pestalotia Pelargonii*; (b) *P. Podocarpi*; (c) *P. Rapancae*.

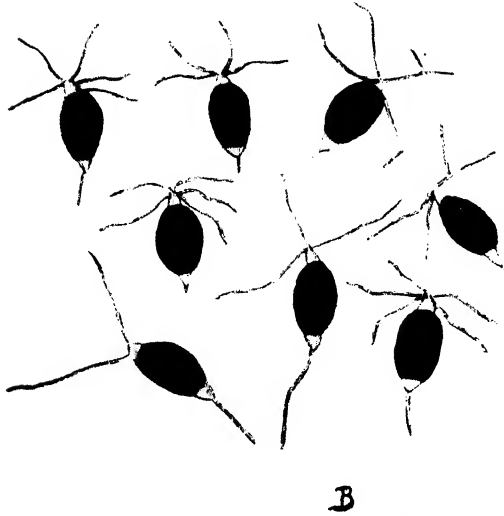
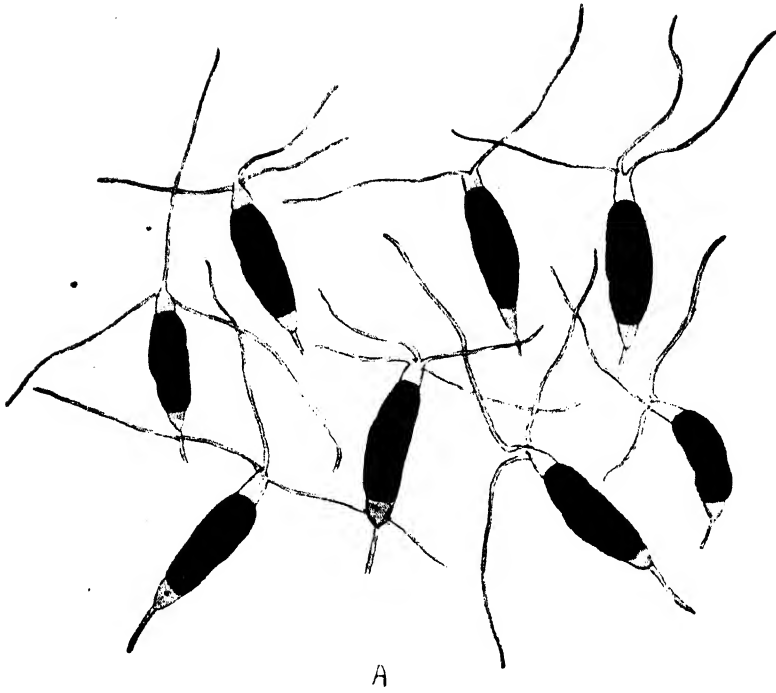
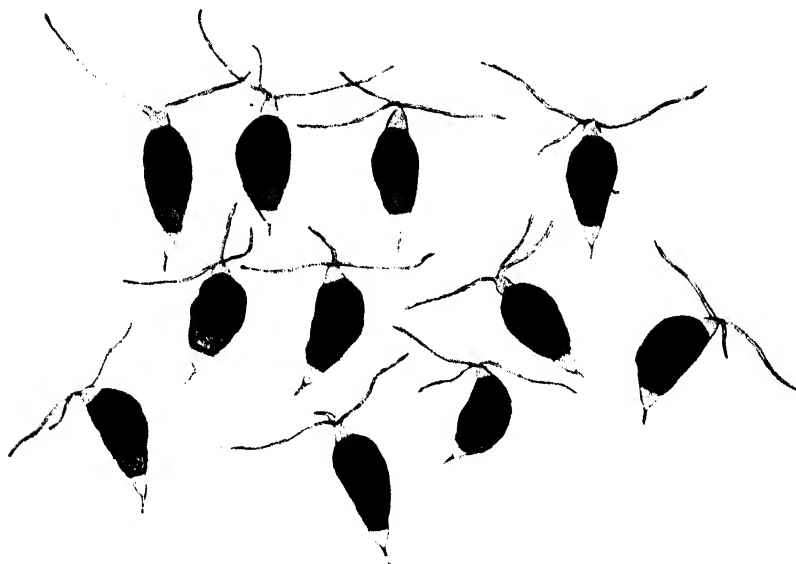


Plate IV.—Conidia of: (a) *Pestalotia Trichocladi*; (b) *P. Watsoniae*.



A



B

Plate V.—Conidia of: (a) *Pestalotia Pterocelastri*; (b) *P. Laughtonae*.

SOUTH AFRICAN ASCOMYCETES IN THE NATIONAL HERBARIUM.

By Ethel M. Doidge.

Part VI.

196. *Erikssonia Carissae* Doidge nov. spec.

Perithecia hypophylla, maculis dilute brunneolis usque $10\ \mu$ diam., insidentia, laxe v. densiuscule dispersa, immersa, globosa, $75\text{--}120\ \mu$ diam.; pariete $25\text{--}40\ \mu$ crasso stromatice e stratis numerosis cellularum tenuiter tunicatarum olivaceo-brunnearum, angulatarum, $5\text{--}6\ \mu$ diam. composito, superne cum epistromate connato; epistroma emergentia, alata, recurvata, plus minus radiatim usque $130\ \mu$ diam. producta; ostiolo $20\text{--}25\ \mu$ longo, haud vel vix prominulo, poro truncato-conico v. cylindraceo, ca. $12\text{--}16\ \mu$ lato pertuso. Asci cylindracei v. cylindraceo-clatati, 8-spори, superne late rotundati, brevissime pedicellati, $45\text{--}55 \times 6\text{--}7\ \mu$, tenuiter tunicati, ad apicem leniter incrassati. Sporae distichae, oblongo-clavatae, utrinque rotundatae, 1-septatae, hyalinae, $12.5\text{--}15 \times 2\text{--}3\ \mu$. Paraphyses filiformes, mox mucosae.

Hab. in foliis *Carissae bispinosae*, Mtunzini prope Eshowe, leg. E. M. Laughton, 33545.

Perithecia on dry, light brown leaf spots, which are circular to irregular in outline and have a raised, dark brown or black line at the margin; hypophyllous, scattered or in small groups, occasionally confluent. Perithecia globose, $75\text{--}120\ \mu$ diam., one-half to two-thirds immersed in the leaf tissue; perithecial wall brown, stromatic, $10\text{--}15\ \mu$ thick, composed of thin-walled, olive-brown, angular, parenchymatous cells, $5\text{--}6\ \mu$ diam. Above, the wall is continuous with the epistroma, which ruptures the epidermis and emerges to the leaf surface, growing out, to a diameter of $130\ \mu$, into re-curved, more or less radiating strands, each composed of a number of irregular rows of cells; the ruptured epidermis adheres closely to the sides of the epistroma. Externally the wall is connected with hyphae which penetrate into the leaf tissues; these are $5\text{--}6\ \mu$ thick, frequently septate and often constricted at the septa. Ostiole $20\text{--}25\ \mu$ long, completely merged with the epistroma and not protruding beyond the stromatal wings; traversed by a pore which is truncate-conical to cylindrical and about $10\text{--}16\ \mu$ diam. Asci cylindrical to cylindrical-clavate, 8-spored, broadly rounded above, not tapering or tapering slightly downwards, very briefly pedicellate, $45\text{--}55 \times 6\text{--}7\ \mu$, wall ca. $1\ \mu$ thick, slightly thickened, $2.5\ \mu$ at the apex. Spores distichous, oblong-clavate, 1-septate, hyaline, $12.5\text{--}15 \times 2\text{--}3\ \mu$, upper cell slightly shorter and broader than the lower, broadly rounded above, tapering gradually downwards. Paraphyses slender, filiform, disappearing early.

on leaves of *Carissa bispinosa* (L.) Desf., Mtunzini, near Eshowe. E. M. Laughton, 33545.

Under a hand lens this fungus has not a definitely stellate appearance; the strands forming the epistroma are not very long and are surrounded by the thick, ruptured epidermis, which holds them more or less erect; they are thus recurved rather than spreading, but are distinctly radiating.

197. *Microcyclus kentaniensis* Doidge nov. spec.

Stromata caulicola, in greges plus minus elongatos usque $5\ \text{mm.}$ longos aggregata, superficialia, atra, opaca, tuberculata, $400\text{--}750\ \mu$ lata, $200\text{--}250\ \mu$ alta, pede breve centrali,

150–200 μ crassa, innato suffulta, e cellulis 7.5–10 μ diam. contexta. Loculi immersi, usque 15 in quoque stromate, 100–125 μ lati, 110–140 μ alti, prominuli. Asci fasciculati, oblongo-clavati, recti v. curvati, stipitati, 60–75 \times 10–12.5 μ . Sporae plerumque distichae, oblongae, medio septatae, haud vel vix constrictae, 20–22.5 \times 3–4 μ .

Hab. in caulibus *Asparagi plumosi*, Kentani, leg. A. Pegler, 8885.

Stromata caulicolous, in irregular elliptical groups up to 5 mm. long, on yellow-brown, indeterminate spots, superficial, round to irregular in outline, 400–750 μ diam., 200–250 μ high, irregularly tuberculate, with dull dark red or black surface in which the ostioles show as pale spots; connected with the hypostroma in the cortical tissues by a short central foot, which ruptures the thick cuticle and expands to form the fertile part of the stroma. Foot 150–200 μ broad, composed of prosenchymatous rows of cells 5–6 μ broad, which gradually give place to the polygonal parenchyma of the outer layers of the stroma, with cells 7.5–10 μ diam. Loculi 6–10, or up to 15 in each stroma, fairly regularly spaced, each under a tubercular prominence of the stroma, 100–125 μ broad, 110–140 μ high, subglobose to ovate, lined with elongated stroma cells 10–13 μ long, 4–6 μ broad. Asci borne on a layer of floccose hyphae which line the inner wall of the loculus and converge at the ostiole like periphyses. Ostiole short, broadly truncate-conical. Asci fasciculate, 8-spored, oblong-clavate, straight or curved, rounded above, pedicellate, 60–75 \times 10–12.5 μ , with knob-like foot 3–4 μ long, often bent or curved. Spores distichous, oblong, hyaline, 1-septate, not constricted at the septum or slightly so, 20–22.5 \times 3–4 μ ; cells more or less equal in length or the upper slightly shorter and broader; the lower cell cylindrical, the upper slightly dilated above the septum and tapering to the rounded apex.

on stems of *Asparagus plumosus* Bkr., Kentani, A. Pegler, 8885.

198. **Erysiphe Brachystegiae** Doidge nov. spec.

Mycelium amphigenum, effusum, persistens, albidum. Conidia ellipsoidea v. cylindracea, 27.5–40 \times 11–15 μ . Perithecia haud numerosa, sparsa v. subgregaria, globoso-depressa, 180–260 μ diam., cellulis parietis exterioris indistinctis. Appendices 25–40 in quoque perithecio, aequatoriales, ubique hyalinae, simplices, rectae v. flexuosae, plerumque 500–750 μ longae, basin 5–6 μ latae, crasse tunicatae, sursum versus non vel leniter latiores, ad apicem simplices, rectae v. lenissime incurvatae. Asci ca. 20–25 in quoque perithecio, ovati v. subclavati, antice late rotundati, postice attenuati, 80–100 \times 45–55 μ . Sporae plerumque 8, hyalinae, continuae, ellipsoideae, 25–30 \times 15–17.5 μ .

Hab. in foliis *Brachystegiae Randii*, Salisbury, leg. Hopkins, 25946, 29921.

Mycelium amphigenous, effuse, white or yellowish. Conidia ellipsoid to cylindrical, 27.5–40 μ long, 11–15 μ broad. Perithecia not numerous, scattered or in small groups, 180–260 μ diam., slightly flattened-globose. Outer cells of perithecial wall small, obscure. Appendages numerous, 25–40, forming a white ring round the perithecia, equatorial, hyaline throughout, radiating, simple, straight or flexuous, mostly 500–750 μ long; thick-walled at the base and 5–6 μ broad, straight at the tip, sometimes slightly dilated, occasionally slightly incurved, not typically uncinuate. Asci ca. 20–25 in each perithecium, ovate or subclavate, broadly rounded above, tapering more or less below to a short foot, 80–100 μ long, 45–55 μ broad, 8-spored. Spores usually 8, seldom fewer, ellipsoid, hyaline, continuous 25–30 μ long, 15–17.5 μ broad.

on leaves of *Brachystegia Randii* Bak. f., Salisbury, Hopkins 1647, 25946, 26621.

This fungus was listed by Hopkins as *Uncinula* sp. in his "Descriptive List of Plant Diseases in S. Rhodesia" (Mem. Dept. Agric. S. Rhodesia No. 2, 1939, p. 7). The appendices are occasionally slightly incurved at the tips, but none were seen which were typically uncinuate. The material is unfortunately scanty.

199. *Erysiphe communis* (Wallr.) Link.

in Willd. Sp. Plant. 6 (1824) p. 105, *pro parte*.

Blumer, Erysiph. Mittel-europas (1933) p. 177.

as *Erysiphe Polygoni* DC. in Doidge, Trans. Roy. Soc. S. Afric. 5 (1915), p. 241.

Mycelium and conidial form variable. Conidia usually single, rarely in chains, $26-40 \times 15-17.5 \mu$. Perithecia scattered or more or less grouped, flattened-globose, $75-130 \mu$ diam.; cells of perithecial wall irregularly angular, $10-25 \mu$ diam. Appendages basal, hyaline or brown, usually myceloid, tortuous, 1-5 times as long as the diameter of the perithecium. Asci 3-10, $50-70 \times 30-50 \mu$, 3-6-spored. Spores hyaline, ellipsoid, continuous, $18-25 \times 10-15 \mu$.

on leaves of *Triumfetta Sonderii* Ficalho and Hiern., Sunnyside, Pretoria, Doidge' 2291 and v. d. Byl, 8880.

200. *Erysiphe Jatrophae* Doidge nov. spec.

Mycelium amphigenum, plagulas plus minus rotundatas albas efficiente vel totam folii paginam obtegente. Conidia ellipsoidea, $30-40 \times 15-20 \mu$. Perithecia sparsa v. laxe gregaria, globosa, $90-105 \mu$ diam., cellulis parietis exterioris $15-20 \mu$ diam. Appendices breves, plerumque dimidium perithecii diametrum subaequant, sat numerosae hyalinae, tenues, tortuosae, simplices. Asci plerumque 3, rarius 2, rarissime 4 in quoque perithecio, ovati, sessiles v. vix pedicellati, $35-57.5 \times 38-45 \mu$. Sporae 4-6, ellipsoideae, hyalinae, continuae, $17.5-22.5 \times 9-12.5 \mu$.

Hab. in foliis *Jatrophae Zeyheri*, Pietersburg, leg. Thomsen, 1286.

Amphigenous, forming more or less round white patches, or covering the whole leaf surface. Conidia ellipsoid, $30-40 \mu$ long, $15-20 \mu$ broad. Perithecia on both sides of the leaf, scattered or loosely grouped, globose, $90-105 \mu$ diam. Cells of perithecial wall irregularly angular, $15-20 \mu$ diam. Appendages short, length not more than half the diameter of the perithecium, fairly numerous, hyaline, delicate, tortuous and mycelium-like. Asci mostly 3, sometimes 2, very rarely 4 in each perithecium, ovate, sessile or very briefly pedicellate, $35-57.5 \times 38-45 \mu$, 4-6 spored. Spores ellipsoid, hyaline, continuous, $17.5-22.5 \mu$ long, $9-12.5 \mu$ broad.

on leaves of *Jatropha Zeyheri* Sond., Pietersburg, Thomsen, 1286, Type.

Jatropha natalensis Müll. Arg. Ehlanzeni, Doidge, 8248 (Oidium only).

Jatropha Woodii O. Ktze., Ladysmith, Pole Evans, 2030. (Oidium only).

Acalypha angustata Sond., Garstfontein, Pretoria Distr., Erasmus, 1266.

Sub *Erysiphe Polygoni* DC. in Doidge, Trans. Roy. Soc. S. Afric. 5 (1915), p. 241. This species belongs to the *Erysiphe Polygoni* group and is near *Erysiphe Urticae* (Wallr.) Klotzsch.

201. *Erysiphe nitida* (Wallr.) Rabenh.

Deutschl. Krypt. Fl. 1 (1844), p. 231.

Blumer, Erysiph. Mittel Europas (1933), p. 229.

Erysiphe Polygoni DC. emend. Salmon, Mem. Torrey Bot. Club 9 (1900) p. 174, *pro parte*.

Amphigenous and caulicolous, often causing discolouration of the stem tissues under the mycelium. Mycelium well developed, more or less persistent. Conidia ellipsoid, $25-37 \mu$ long, $14-20 \mu$ broad. Perithecia scattered or in groups, globose or flattened globose, $75-110 \mu$ diam.; cells of the perithecial wall distinct, polygonal, $10-25 \mu$ diam. Appendages not very numerous, 5 to 30 to each perithecium, usually tortuous, mycelium-like, 1 to 5 times as long

as the diameter of the perithecium, only a few reaching the maximum length, septate, arising from the base of the perithecium, light brown, rather thick-walled at the base and ca. $5\ \mu$ broad, becoming paler and thinner walled upwards; occasionally irregularly branched, especially near the tip. Asci usually 2-6 in each perithecium, seldom as many as 8 and exceptionally only 1, ovate, sessile or briefly pedicellate, $50-70\ \mu$ long, $30-45\ \mu$ broad. Spores 3-5, seldom 2, in each ascus, ellipsoid, hyaline, continuous, $18-25 \times 10-15\ \mu$.

on *Delphinium Ajacis* Linn., Johannesburg, *Sieling*, 14123; Arcadia, Pretoria, Bottomley, 23624; Invani, Cape, *Bisset*, 26598.

Delphinium cultorum Voss, New England Rail, Cape, *Lawrence*, 25928; Salisbury, *Hopkins*, 25947; Durban, *McClean*, 24897; White River, *Wager*, 27694; Brooklyn, Pretoria, *Doidge*, 28510, 28957; Pietermaritzburg, *Schmutz*, 30120.

on *Knowltonia glabricarpellata* Huth, Knysna, *Bottomley*, 32261. (Oidium only).

202. *Erysiphe umbelliferarum* de Bary.

Beitr. z. Morph. u. Phys. Pilze 1 (1870) p. 50.

Blumer, *Erysiph. Mittel-Europas* (1933), p. 195.

Mycelium and conidia well developed, amphigenous and caulicolous. Hyphae much branched, with more or less definitely lobed haustoria. Conidia abstricted singly, rarely in short chains, small, cylindrical, $30-42\ \mu$ long, $12-18\ \mu$ broad. Perithecia much flattened, $90-115\ \mu$ diam.; cells of perithecial wall small, often obscure. Appendages usually numerous, short, once to twice as long as the diameter of the perithecium, brown, often irregularly bent and usually once, or several times, irregularly branched. Asci 3-8, seldom up to 10 in each perithecium, ovate to subglobose, very briefly pedicellate, $55-70 \times 30-45\ \mu$, 3-5, seldom 6-spored. Spores ellipsoid, hyaline, continuous, $20-28 \times 10-15\ \mu$.

on *Trachymene caerulea* Graham, leaves and stems, Utrecht, *v. d. Stryk*, 30929.

The fungus on *Trachymene* has usually about 5 asci in each perithecium, and 4-5 spores in each ascus. The appendages are not very numerous and are rather sparingly branched; otherwise it agrees closely with the description given by Blumer (l.c.). He mentions a wide range of hosts belonging to the *Umbelliferae*, but *Trachymene* is not included.

203. *Phyllactinia Acaciae* Syd.

Ann. Myc. 33 (1935), p. 233.

Hypophyllous; mycelium effuse, fairly well developed, more or less persistent, formed of hyphae $3-5\ \mu$ thick. Conidia cylindrical, $45-60\ \mu$ long, obtusely rounded at both ends, often with lateral walls somewhat concave, and thus $10-12.5\ \mu$ broad at the ends, $6-9\ \mu$ broad in the centre. (According to Sydow l.c., the conidia are $50-70 \times 12-16\ \mu$, but none of those examined exceeded the measurements given above.) Perithecia scattered, not numerous, $120-210\ \mu$ diam.; cells of perithecial wall rather obscure, ca. $10-12.5\ \mu$ diam. Appendages 6-12, hyaline throughout, rigid, simple, ca. $90-150\ \mu$ long; bulbous base $25-35\ \mu$ diameter; above the swollen base, appendages are $7.5-10\ \mu$ thick and thick-walled, tapering to $2.5-4\ \mu$ at the tip where the wall is thinner; near the base the wall is ca. $2.5\ \mu$ thick and the lumen almost obliterated, but the thickness is uneven. Asci ca. 5-10 in each perithecium, ovate, briefly pedicellate, $45-60 \times 20-30\ \mu$, 2-3-spored. Spores hyaline, ellipsoid, continuous, ca. $22-30 \times 12-14\ \mu$.

on *Acacia robusta* Burch., on leaves, Klapperkop, near Pretoria, *Mogg*, 23428 (Type collection).

Unfortunately there are very few perithecia on the type collection, and these are barely mature. Fungi belonging to the *Erysiphaceae* form perithecia comparatively rarely under South African conditions, and they are seldom found on cultivated plants.

204. *Phyllactinia Combreti* Doidge nov. spec.

sub *Phyllactinia corylea* (Pers.) Karst., in Doidge, Trans. Roy. Soc. S. Africa 5 (1915), p. 242.

Mycelium hypophyllum, persistente, primitus plagulas rotundatas v. irregulares albas efficiente, deinde effusum, magnam folii partem obtegente. Conidia oblongo-ellipsoidea, rarius subclavata, plerumque utrinque leniter attenuata, $62.5-80 \times 17.5-22.5 \mu$. Perithecia sat numerosa, sparsa, globoso-depressa, $275-400 \mu$ diam.; cellulis parietis exterioris obscuris. Appendices 15-20 in quoque perithecio, ubique hyalinae, $220-450 \mu$ longae, parte basali vesiculoso-inflatae, $35-50 \mu$ diam., supra basim bulbosum $15-20 \mu$ latae, crasse tunicatae, sursum versus leniter attenuatae ad apicem tenuiter tunicatae, $8-10 \mu$ latae. Asci numerosi, ca. 40-50 in quoque perithecio, oblongi v. ovati, antice late rotundati, postice breviter pedicellati, $80-95 \times 27.5-37.5 \mu$, crasse tunicati, 2-3 spori. Sporae ellipsoideae, hyalinae, continuae, $35-40 \times 17.5-25 \mu$.

Hab. in foliis *Combreti Zeyheri*, Pretoria, leg. Doidge, 1506.

Hypophyllous; mycelium fairly well developed, at first forming round to irregular, white or yellowish blotches, later effuse, covering a great part of the leaf surface: more or less persistent. Conidia oblong-ellipsoid, rarely subclavate, usually tapering slightly to rounded ends, $62.5-80 \times 17.5-22.5 \mu$. Perithecia fairly numerous, scattered, flattened-globose, $275-400 \mu$ diam.; cells of perithecial wall obscure. Appendages 15-20 to each perithecium, $220-450 \mu$ long, hyaline throughout; bulbous base $35-50 \mu$ diam.; above the swollen base, $15-20 \mu$ thick and thick-walled, wall ca. 4μ thick: rapidly becoming thin-walled above and tapering very slightly to the tip, which is delicate, easily crushed and $8-10 \mu$ thick. Asci numerous, ca. 40-50 in each perithecium, oblong or ovate, $80-95 \times 27.5-37.5 \mu$, contracted rather suddenly below into a foot which is straight and peg-like or is bent; foot up to 20μ long; asci thick-walled, 2-3-spored. Spores ellipsoid, hyaline, continuous, $35-40 \times 17.5-25 \mu$. Penicillate cells rather well developed.

on *Combretum Zeyheri* Sond., on leaves, Sunnyside, Pretoria, Doidge, 1506 (Type), and *Pole Evans*, 9743; Letaba Drift, Doidge, 1806.

205. *Phyllactinia Erythrinae* Doidge nov. spec.

Mycelium hypophyllum, persistente, albidum, saepe densum, totam folii paginam obtegens, interdum tenue, plagulas irregulares efficiens. Conidia clavata, $62.5-87.5 \times 15-22.5 \mu$, plerumque $75-80 \times 17.5 \mu$, antice rotundata, postice ad basim truncatam $7-9 \mu$ latam attenuata. Perithecia sat numerosa, subgregaria, globosa, $180-240 \mu$ diam., cellulis parietis exterioris $10-15 \mu$ diam. Appendices 9-15 in quoque perithecio, rectae, haud septatae, basi vesiculo-inflatae $37.5-45 \mu$ diam., supra basim bulbosam $10-15 \mu$ latae, crasse tunicatae, sursum sensim attenuatae ad apicem $4-5 \mu$ latae tenuiter tunicatae. Asci immaturae.

Hab. in foliis *Erythrinae caffrae*, Greytown, leg. Doidge, 15418.

Hypophyllous. Mycelium and oidial stage often well developed, dense, completely covering the under side of the leaf: sometimes thin, arachnoid, and forming only irregular patches. Conidia clavate, $62.5-87.5 \mu$ long, $15-22.5 \mu$ broad in the broadest diameter, which is usually about one-third of the distance from apex to base; rounded at the apex, tapering to the truncate base, which is $7-9 \mu$ broad: most of the conidia are $75-80 \times 17.5 \mu$. Perithecia often numerous, closely and fairly evenly distributed in the mycelium or in small groups, but not closely crowded, globose, $180-240 \mu$ diam.; cells of the perithecial wall rather obscure, ca. $10-15 \mu$ diam. Appendages 9-15 to each perithecium, simple, straight, non-septate, longer than the diameter of the perithecium, $350-450 \mu$ long; basal swelling $37.5-45 \mu$ diam.; appendages $10-15 \mu$ thick just above the bulbous base and thick-walled, tapering gradually and becoming thinner-walled towards the tip, which is $4-5 \mu$ broad.

Penicillate cells numerous, well developed. Asci quite immature in all the perithecia examined.

on *Erythrina caffra* Thunb., on leaves, Greytown, *Doidge*, 15418, Type; Nelspruit, *Wager*, 23398.

Oidium only; Durban, 25895; Harden Heights, *Pole Evans*, 1394; Nelspruit, *Liebenberg*, 25991.

206. *Phyllactinia Evansii* Doidge nov. spec.

Mycelium hypophyllum, tenue, effusum, subpersistens. Conidia oblonga, antice late rotundata, basi rotundata v. truncata, $45-55 \times 10-15 \mu$. Perithecia sparsa, globoso-depressa, $180-220 \mu$ diam., cellulis parietis exterioris subobscuris, angulato-rotundatis, $7-10 \mu$ diam. Appendices $10-15$ in quoque perithecio, ubique hyalinae, rigidae, $150-200 \mu$ longae, basi vesiculoso-inflatae $25-35 \mu$ diam.; supra basim bulbosam $7-10 \mu$ latae, crasse tunicatae, ad apicem tenuiter tunicatam ca. 4μ latam sensim attenuatae; plerumque simplices, interdum furcatae. Asci numerosae, usque 40 in quoque perithecio, ovati, raro oblongi, breviter pedicellati, $55-70 \times 22-35 \mu$, plerumque 2- rarius 3-sporae. Sporae ellipsoideae, hyalinae, continuae, $20-35 \times 10-17.5 \mu$ plerumque $30-35 \times 15-17.5 \mu$.

Hab. in foliis *Burkea africanae*, Wonderboom, prope Pretoria, leg. *Pole Evans*, 9758.

Hypophyllum. Mycelium rather thin, effuse, more or less persistent. Conidia oblong, broadly rounded above, rounded or truncate at the base, $45-55 \times 10-15 \mu$. Perithecia scattered, flattened-globose, $180-220 \mu$ diam.; structure of the perithecial wall rather obscure, formed of rounded-angular cells $7-10 \mu$ diam. Appendages $10-15$ to each perithecium, hyaline throughout, rigid, $150-200 \mu$ long; bulbous base $25-35 \mu$ diam.; above the swollen base, usually simple, $7-10 \mu$ thick, tapering upwards to about 4μ at the rounded apex; wall up to 2.5μ thick, or the lumen obliterated in places, wall getting gradually thinner upwards; occasionally forked just above the bulbous base, branches nearly equal, or one much shorter than the other. Asci numerous, up to 40 in each perithecium, ovoid, rarely oblong, briefly pedicellate, $55-70 \times 22-35 \mu$, 2-spored, rarely 3-spored. Spores ellipsoid, hyaline, continuous, $30-35 \times 10-17.5 \mu$, mostly $30-35 \times 15-17.5 \mu$, the smaller spores in the 3-spored asci.

on *Burkea africana* Hook., on leaves, Wonderboom, Pretoria district, *Pole Evans*, 9758.

Phyllactinia rhoina Doidge nov. spec.

Mycelium hypophyllum, tenuissimum, effusum. Perithecia sparsa, globoso-depressa, $180-220 \mu$ diam., cellulis parietis exterioris obscuris. Appendices $6-9$ in quoque perithecio, $200-300 \mu$ longae, basi vesiculoso-inflatae, $45-50 \mu$ diam., supra basim bulbosam $10-11 \mu$ latae, crasse tunicatae, sursum versus leniter attenuatae ad apicem fragilem ca. 6μ latam. Asci numerosi ca. $20-30$ in quoque perithecio, ovati v. oblongi, apice late rotundati, infra pedicellati, 2-spori rarius 3-spori. Sporae vix maturae, hyalinae, continuae, ellipsoideae, $30-37.5 \times 17.5-21 \mu$.

Hab. in foliis *Rhois pyroides* var. *transvaalensis*, Garstfontein prope Pretoria, leg. *Pienaar*, 6662.

Hypophyllum. Mycelium not conspicuous, conidia not seen. Perithecia scattered, flattened-globose, $180-220 \mu$ diam.; cells of the perithecial wall obscure. Appendages $6-9$ to each perithecium, $200-300 \mu$ long or possibly longer, as the apices of those examined were usually broken; basal swelling $45-50 \mu$ diam.; above the bulbous base $10-11 \mu$ thick, with wall 2.5μ thick becoming thinner-walled above and tapering very slightly to an apex 6μ broad. Asci numerous, ca. $20-30$ in each perithecium, ovate or oblong, broadly rounded above, $60-75 \times 25-32.5 \mu$, contracted suddenly below into a stalk which is straight or bent

and 10–25 μ long; asci 2-spored, rarely 3-spored. Spores barely mature, hyaline, ellipsoid, continuous, 30–37.5 \times 17.5–21 μ . Penicillate cells fairly well developed.

on *Rhus pyroides* Burch, var. *transvaalensis* Schon., on leaves, Garstfontein, Pretoria district, *Pienaar*, 6662, Type and 1533; Brits, *Moore*, 23235.

Rhus discolour E. Mey., Grootfontein, nr. Harrismith, v. d. *Byl*, 2317.

208. **Phyllactinia Sphenostylidis** Doidge nov. spec.

Mycelium hypophyllum, persistens, albidum, effusum. Conidia clavata, apice rotundata, infra attenuata ad basim truncatam, 57.5–80 \times 20–25 μ , plerumque 50–52.5 \times 20–22.5 μ . Perithecia sparsa, globoso-depressa, 180–230 μ diam., cellulis parietis exterioris 10–15 μ latis. Appendices 5–9 in quoque perithecio, simplices, ubique hyalinae, rigidae, 175–235 μ longae, basi vesiculoso-inflatae, 35–45 μ diam.; supra basim bulbosam 10–12.5 μ latae, ad apicem 4 μ latam sensim attenuatae. Asci immaturae.

Hab. in foliis *Sphenostylidis angustifoliae*, Groenkloof, prope Pretoria, leg. Bottomley, 17024.

Hypophyllous. Mycelium and conidial stage usually well developed, forming dense, dirty white or yellowish patches, or covering the whole of the under surface of the leaf. Conidia clavate, rounded above, 50–80 μ long, 20–25 μ broad at the broadest diameter, which is about one-third of the distance from apex to base, tapering downwards to the truncate base, which is 7.5–10 μ broad; the majority of the conidia are 50–52.5 \times 20–22.5 μ . Perithecia scattered, 180–230 μ diam.; cells of the perithecial wall obscure, 10–15 μ diam. Appendages 5–9 on each perithecium, simple, hyaline throughout, rigid, 175–235 μ long; swollen base 35–45 μ diam.; above the basal swelling, appendages are 10–12.5 μ thick with wall ca. 1.5 μ thick, tapering gradually upwards and becoming thinner-walled towards the tip, which is ca. 4 μ thick. Asci quite immature in numerous perithecia examined. Penicillate cells numerous, well developed.

on *Sphenostylis angustifolia* Sond., on leaves, Groenkloof, Pretoria, *Bottomley*, 17024 Type; Sunnyside, Pretoria, *Pole Evans*, 1413, 1510, 6693; Garstfontein, Pretoria district, *Pienaar*, 2252; Waterkloof, *Wager*, 23357; Donkerpoort, *Doidge* and *Bottomley*, 29730.

This fungus occurs commonly in the neighbourhood of Pretoria; abundant material has been collected and examined from late summer to early spring, but no mature asci have been found.

209. **Uncinula aspera** Doidge.

Trans. Roy. Soc. S. Africa 5 (1915), p. 240.

Epiphyllous. Mycelium thin, arachnoid, whitish, effuse, evanescent or sub-persistent. Perithecia scattered or gregarious, flattened-globose, 90–105 μ diam., with wall composed of rather distinct, irregularly angular cells, 12–17.5 μ diam. Appendages equatorial, 15–30 to each perithecium, straight or more or less flexuous, hyaline, simple, aseptate, equal in length to the diameter of the perithecium or exceeding it, 125–165 μ long; 5–6 μ thick at the base, becoming gradually broader upward to a thickness of 9 μ below the tip, then tapering to the apex; tips closely uncinuate or somewhat spiral; wall ca. 1.5 μ thick near the base, becoming gradually thinner upwards, ca. 0.5 μ thick at the apex, roughened externally, especially in the lower half, with small, scattered, irregular protuberances. Asci 4–6 in each perithecium, ovate or subglobose, sessile or very briefly pedicellate, 51–57 \times 45–48 μ , 4–6-spored. Spores oblong, hyaline, continuous, 18–21 \times 13–14 μ .

on *Ficus Petersii* Warb., on leaves, Wonderboom, *Burt Davy*, 1838.

210. *Uncinula combreticola* Doidge nov. spec.

Mycelium amphigenum plerumque epiphyllum, persistens, effusum. Conidia oblonga, utrinque truncata v. sub-rotundata, $30-37.5 \times 14-15 \mu$. Perithecia dense congesta v. discreta, globoso-depressa, $100-140 \mu$ diam., plerumque ca. 125μ diam; cellulis parietis exterioris polygonalibus, $10-12 \mu$ latis. Appendices equatoriales, numerosae, $50-75$ in quoque perithecio, $90-140 \mu$ longae, perithecii diametrum subaequantes, hyalinae, simplices, tenue tunicatae, basi $4-5 \mu$ crassae, sursum leniter dilatatae usque $7.5-9 \mu$, rarius 10μ , apice laxae uncinatae v. helicoideae. Asci $5-8$ in quoque perithecio, immaturi.

Hab. in foliis *Combreti Zeyheri*, Nelspruit, leg. Doidge, 22377.

Mycelium amphigenous, but mostly epiphyllous, at first forming rather poorly defined* irregularly circular, scattered spots, on the upper side becoming confluent and covering the greater part of the leaf surface. Mycelium dirty white or yellowish, dense, persistent. Conidia oblong, truncate or somewhat rounded at both ends, $30-37.5 \times 14-15 \mu$. Perithecia closely crowded in small or large patches, less frequently scattered, globose, flattened, $100-140 \mu$ diam., mostly ca. 125μ ; perithecial wall composed of polygonal cells $10-12 \mu$ broad. Appendages equatorial, $50-75$ in number, on an average equalling in length the diameter of the perithecium, $90-140 \mu$ long, hyaline, simple, thin-walled throughout, smooth, occasionally slightly rough in places, not septate; $4-5 \mu$ thick at the base, broadening upwards to $7.5-9 \mu$, rarely 10μ , just below the tip and then tapering slightly to the apex; tips loosely uncinuate or loosely spiral. Immature appendages are often distended abruptly below the tip, which is often hastate and straight, later becoming uncinuate. Asci $5-8$ in each perithecium, immature.

on *Combretum Zeyheri* Sond., on leaves, Nelspruit, Doidge, 22377, Type; Ledzee, Doidge, 1793.

211. *Uncinula Eylesii* Doidge nov. spec.

Mycelium amphigenum et petiolicolum, persistens, effusum. Conidia ellipsoidea, $14-30 \times 10-14 \mu$, plerumque $20-22.5 \times 10 \mu$. Perithecia sparsa v. subgregaria, globoso-depressa, $90-105 \mu$ diam., cellulis pariete exterioris polygonalibus, $10-15 \mu$ latis. Appendices $24-26$ in quoque perithecio, $80-125 \mu$ longae, perithecii diametrum subaequantes, simplices, leves, basi brunnea $5-6 \mu$ latae ad apicem hyalinem $3-4 \mu$ crassam sensim attenuatae; apice primitus rectae deinde laxae uncinatae. Asci $5-7$ in quoque perithecio, ovati, breviter pedicellati, $35-42.5 \times 20-22 \mu$ (immaturi).

Hab. in foliis *Acalypha ciliatae*, Salisbury, leg. Eyles, 13992.

Mycelium amphigenous and petiolicolous, rather densely arachnoid, persistent, at first forming more or less round, poorly defined spots and finally covering the greater part of the leaf surface. Conidia ellipsoid, $14-30 \times 10-14 \mu$, mostly $20-22.5 \times 10 \mu$. Perithecia scattered or rather loosely grouped, often near the veins of the leaf, flattened-globose, $90-105 \mu$ diam. Appendages $24-36$ on each perithecium, usually equalling in length the diameter of the perithecium or somewhat longer, rarely shorter, $80-125 \mu$ long; $5-6 \mu$ thick at the base, which is golden brown, becoming gradually paler upwards and tapering slightly to the hyaline, rounded apex, which is $3-4 \mu$ thick; tips at first straight, then very loosely uncinuate, forming one complete turn or a half turn, $12.5-15 \mu$ across; simple, smooth, non-septate, wall ca. 1μ thick throughout or slightly thicker at the base. Asci $5-7$ in each perithecium, ovate, briefly pedicellate, $35-42.5 \times 20-22 \mu$, immature.

on leaves of *Acalypha ciliata* Forsk., on leaves, Salisbury, Eyles 2071, 13992.

212. *Uncinula incrassata* Salm.

Ann. Myc. 6 (1908), p. 524.

Sacc. Syll. Fung. XXII: 22; Gepp, Journ. Linn. Soc. Bot., 40 (1911), p. 242.

Uncinula Pterocarpi Doidge, Trans. Roy. Soc. S. Africa 5 (1915) p. 240, Pl. II.

Amphigenous ; mycelium densely arachnoid, dirty white or yellowish, often covering the greater part of the leaf surface, persistent. Conidia not seen. Perithecia very numerous, in small or large groups, or more or less scattered, at first yellow, sub-globose, then chestnut colour, flattened-globose, 100–140 μ diam. Perithecial wall composed of polygonal cell 10–12 μ diam. Appendages 60–120 to each perithecium, thickly set over the whole upper half of the perithecium, varying in length, 50–150 μ long, i.e., some exceeding the diameter of the perithecium, some only half of its diameter and others intermediate in length ; the longer appendages are borne round the central zone of the perithecium and the shorter near its apex. Appendages not septate, 4–7 μ thick, mostly 5–6 μ , rather irregularly thick-walled throughout ; even before the perithecium is mature becoming thick-walled right up to the apex ; apex usually simply and closely uncinuate, rarely sub-helicoid. Asci 8–12 (3–7 fide Salmon in immature perithecia) ovate, 45–50 \times 20–28 μ , briefly pedicellate, often curved, 4-spored. Spores ellipsoid, hyaline, 13–18 \times 12–13 μ .

on *Pterocarpus rotundifolius* (Sond.) Druce (= *Pt. sericeus* Benth.), Duivelskloof, northern Transvaal, Doidge, 1805.

Although the type of *Uncinula incrassata* has not been available for comparison, there seems to be no doubt, after a more careful study, that *U. Pterocarpi* Doidge is identical with that species ; the original specimen was immature. It was said to be on *Pt. melliferus* Welw., collected on the Zona River, Jibu, Gazaland, by Swynnerton, but it seems probable that the host was wrongly named. *Pt. melliferus* occurs in Angola, and is not included in the list of flowering plants collected in Gazaland by Swynnerton. *Pt. rotundifolius* is a closely related species, and it occurs in Gazaland.

213. *Uncinula polychaeta* (Berk and Curt.) ex Ellis.

Ellis, Journ. Myc. 2 (1886), p. 43.

Salmon, Mem. Torr. Bot. Club 9 (1900), p. 113. Doidge, Trans. Roy. Soc. S. Afric. 5 (1915), p. 240. (For synonymy and further references see Salmon l.c.).

Hypophyllous ; mycelium dense, in irregular, whitish patches, which are often numerous and cover the greater part of the leaf surface, persistent or completely evanescent. Conidiophores slender, hyaline, 4–5-celled, 120–240 μ long, 6–7.5 μ thick at the base, tapering somewhat to 5–6 μ at the apex. Conidia clavate or narrow ovate, hyaline, straight or occasionally curved, rounded above, tapering to the truncate base which is 5 μ broad, 35–75 μ long, mostly 50–55 μ long, 14–17.5 μ broad in the broadest diameter, which is usually about one-third of the length from apex to base. Perithecia more or less closely gregarious on the patches of mycelium, or scattered, 220–400 μ diam. : cells of the perithecial wall rather obscure, polygonal, 6–10 μ diam. Appendages very numerous, usually about 200, closely crowded and 50–200 μ long, in length about one-fourth to two-thirds of the diameter of the perithecium, 4–6 μ thick at the base, hyaline, smooth, simple, aseptate, tapering slightly upwards to the tip, which is 3.5–4 μ thick and closely uncinuate ; thick-walled, with the lumen more or less completely obliterated. Asci very numerous, 34–66 in each perithecium, cylindrical to oblong, broadly rounded above, 75–95 \times 20–30 μ , narrowed rather abruptly below into a stalk 5–20 μ (mostly 5–10 μ) long, which may be straight, but is usually bent near the base, 3–4-spored. Spores ellipsoid, hyaline, continuous, 25–30 \times 12–15 μ .

on *Celtis Kraussiana* Benth., on leaves, Fountains Valley, near Pretoria, van der Byl, 2096, 2202, Pole Evans, 2336, 2361, Bottomley, 34418 ; Garstfontein, Pretoria district, Pienaar, 1260 ; Zoutpansberg, Burt Dary, 181.

This seems to be a variable species ; the collection from the northern Transvaal (No. 181) has perithecia 220–320 μ diam., agreeing with the measurements given by Salmon (loc. cit.) ; in specimens from the Fountains Valley, the perithecia are almost all 300–400 μ diam. The number of spores in the ascus also varies ; in the American examples studied by Salmon,

the asci are almost always 2-spored, with rarely a rudimentary third spore present; a Chinese specimen differed in having asci which are regularly 3-spored; in South African material examined, the asci are 3- or 4-spored in almost equal numbers.

The conidia are most abundant in material collected during February, March and April; leaves showing perithecia in all stages of development were collected in May and June.

214. *Meliola Atalayae* Doidge nov. spec.

Plagulae plerumque epiphyllae, atrae, sparsae, plus minus rotundatae, usque 3-5 mm. diam. Mycelium reticulatum, ex hyphis brunneis, oppositè ramosis, plerumque undulatis rarius rectiusculis, 7-9 μ crassis compositum. Hyphopodia capitata, sat numerosa, plerumque alternantia, rarissime opposita, 14-17.5 μ longa; cellula inferiore breve cylindracea, 4-5 μ longa, 7.5-9 μ lata; superiore ovata v. cylindracea, plerumque late rotundata rarius truncata v. subangulata, rarissime sublobata, 10-12 μ longa, 10-11 μ lata. Hyphopodia

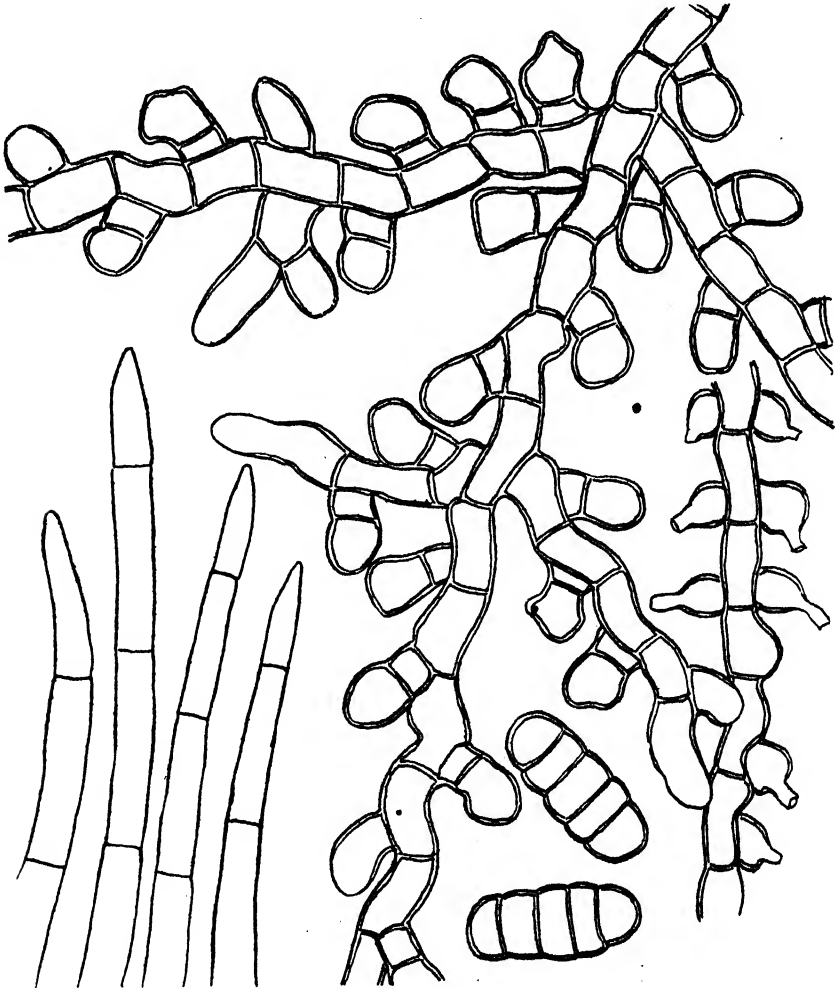


FIG. 1.—*Meliola Atalayae*, mycelium with capitata and mucronate hyphopodia; tips of mycelial setae spores.

mucronata modice numerosa, alternantia, unilateralia v. opposita, haud pallidiore, ampullacea, 12·5–17·5 μ longa, basi 6–9 μ lata, subito in collum obliquum, curvatum v. interdum rectum, 2·5–6 μ longum, 2·5–4 μ crassum attenuata. Setae myceliales haud numerosas, praecipue juxta perithecia evolutae, simplices, rectae v. plus minus curvatae, ubique pellucidae, septatae, 180–240 μ longae, inferne 7–7·5 μ crassae, obscure brunneae, apicem versus pallidiores, haud vel vix attenuatae, acutae, rarissime obtusae v. rotundatae. Perithecia globosa, atra, verrucosa, 140–175 μ diam. Asci 2-sporei. Sporae brunneae, 4-septatae, cylindraceae, utrinque rotundatae, leniter constrictae, 30–35 \times 11–14 μ .

Hab. in foliis *Atalayae natalensis*, in sylvis Ngomi, leg. Joubert, 33912.

Colonies predominantly epiphyllous, hypophyllous colonies rare, scattered, dull black, more or less round; up to 3·5 mm. diam.

Mycelium more or less closely reticulate. Hyphae rather thin-walled, snuff-brown shading to deep olive-buff at the tips, 7–9 μ thick, usually more or less undulating, with short cells 11–15 μ long; there are some hyphae almost straight, with few hyphopodia and cells up to 35 μ long; branching usually opposite, with branches emerging almost at right angles to the main hyphae. Capitate hyphopodia rather numerous, usually one to each cell of the hypha, mostly alternate, rarely opposite, making a wide angle with the hypha, 14–17·5 μ long; basal cell short, cylindrical, 4–5 μ long and 7·5–9 μ broad; head cell ovate or cylindrical, usually broadly rounded, less frequently truncate or somewhat angular, very rarely sub-lobed, 10–12·5 μ long, 10–11 μ broad. Mucronate hyphopodia usually on separate hyphae, but occasionally intermingled with the capitate hyphopodia, alternate, unilateral or opposite, not paler than the hyphae, ampulliform, 12·5–17·5 μ long; sub-globose to oval at the base, which is 6–9 μ diam., constricted suddenly above into a neck 2·5–6 μ long and 2·5–4 μ thick, oblique, curved or occasionally straight. Mycelial setae not numerous, mostly in the neighbourhood of the perithecia, simple, abruptly geniculate at the base and almost straight, or somewhat sinuous, occasionally subfalcate, translucent throughout or sub-opaque near the dark brown base, paler towards the apex; usually 4-septate, the transverse walls being conspicuous; 180–240 μ long, 7–7·5 μ thick at the base, not tapering or tapering very slightly to the apex, which is 5–7·5 μ thick; apex acute, rarely obtuse or rounded.

Perithecia first formed near the centre of the colony, later scattered, globose, black, carbonaceous, 140–175 μ diam., surface cells convex to conical. Asci 2-spored, evanescent. Spores cylindrical, 4-septate, slightly constricted at the septa, broadly rounded at both ends, olive-brown, 30–35 \times 11–14 μ .

on leaves of *Atalaya natalensis* R. A. Dyer, Ngomi Forest, Joubert, 33912.

215. *Meliola campylotricha* Syd.

Ann. Myc. 22 (1924) p. 420.

on *Cassinopsis tinifolia* Harv., Eshowe, E. M. Laughton, 33511.

This is a new host record. *Meliola campylotricha* was originally described on *Apodytes dimidiata* E. Mey., collected in the Woodbush by van der Byl (v. d. Byl 1515).

216. *Meliola capnodioides* Thuem.

von Thuemen in Flora 1876, p. 568.

in *Plectranthi ciliati* E. Mey., foliis vivis in sylvis prope Grahamstown, Promont. bonae spei, Julio 1876. Leg. P. MacOwen, No. 1259.

The portion of the type collection, MacOwen 1259, to be found in the Cryptogamic Herbarium in Pretoria is parasitised, but it is identical with a number of more recent collections on *Plectranthus* and other Labiates, some of which are in excellent condition. It is obvious that *Meliola capnodioides* Thuem. is the correct name for the *Meliola* found on plants belonging to the Labiatae in South Africa.

For various reasons this specific name has been rejected or overlooked. In 1882, Kalchbrenner (Grev. X : 147) published the following note :—

“ *Meliola amphitricha* Fr.

In fol. *Justiciae anagalloides* Nees, Natal, Wood Nos. 241, 22, 57.

In *Plectranthi ciliati* et *Hypsobromo elato* ad Somerset East et Grahamstown, leg. MacOwan, Nos. 1259, 1292, 1328.”

Several different fungi are quoted by Kalchbrenner under the name *Meliola amphitricha* ; MacOwan No. 1259 is *M. capnodioides* Thuem., No. 1328 is *M. capensis* (Kalchbr. and Cooke) Theiss., and No. 1292 is *MacOwaniella congesta* (Wint.) Doidge on *Carissa bispinosa* ; in the case of collection 1292, it is possible that *M. carissae* was also present on some of the leaves.

Gaillard [Le Genre *Meliola* (1892) p. 77] states that according to Cooke *M. capnodioides* Thuem. belongs to *M. amphitricha* and Stevens [Ann. Myc. 26 (1928) p. 289] quotes *M. capnodioides* as a synonym for *M. amphitricha* Fr., a specific name which, as Arnaud has shown [Les Asterinées (1918) p. 228] must be rejected. Stevens includes a South African fungus on *Plectranthus* (No. 11576) under *Meliola Psychotriae* Earle, which was originally described on *Psychotria* (Rubiaceae) from Porto Rico ; he also includes in this species a number of fungi on Acanthaceae.

In the account of the South African species of the Meliolineae [Doidge and Sydow, *Bothalia* 2 (1928) p. 459], MacOwan 1259 was listed under *M. Psychotriae* Earle, with the comment that the specimen is labelled *M. capnodioides* and is included by Gaillard under *M. amphitricha* Fr. The original description of *M. capnodioides* was not seen until MacOwan's “*Opuscula Botanica*” were acquired, in which were included reprints from Flora of von Thuenen's papers on Fungi austro-africani.

M. Psychotriae Earle [Bull. N. York Bot. Gard. 3 (1905) 308] is a very similar species, and a critical study of the Meliolas of this group (Group 9, Stevens l.c., p. 233) occurring on Rubiaceae, Acanthaceae and Labiatae is desirable. In view of the habitual narrow host limitation of the species of *Meliola*, it is hardly likely that a single species will cover a range of hosts including genera of all three families. Should this prove to be the case, the name *M. capnodioides* Thuem. has priority. In the meantime, the South African collections must be classified as follows :—

***Meliola capnodioides* Thuem.**

von Thuenen, Flora 1876, p. 568 ; Sacc. Syll. Fung. I : 61.

sub *Meliola amphitricha* Fr., Kalchbrenner, Grev. X (1882) 147 ; Gaillard Le Genre *Meliola* (1892) 77 ; Stevens, Ann. Myc. 26 (1928) 289.

sub *Meliola microspora* Pat. and Gaill. var. *africana* Doidge, Trans. Roy. Soc. S. Afric. V (1917), 732.

sub *Meliola microspora* Pat and Gaill., Nel. Ann. Univ. Stell. (1942) 20.

on Labiatae :

Plectranthus ciliatus E. Mey., Grahamstown, MacOwan 1259, 20799 ; Inanda, Medley Wood 604, 10350, Kew ; Umzinto Bush, Wager, 32697.

Plectranthus sp., Buccleuch, Doidge, 11576 ; Inanda, Medley Wood, 10353 ; Woodbush, Doidge, 1766.

Stachys aethiopica Linn., Xumeni Forest, Morgan and Doidge, 29895.

Stachys sp., Kat River Valley, Moore, 21027 ; Xumeni Forest, Doidge, 33110.

Labiatae undet., Woodbush, Doidge 17768.

The collections on Acanthaceae previously included (Doidge and Sydow, l.c.) under *M. Psychotriae* Earle are not this species, and are being dealt with by Mr. C. G. Hansford in one of the papers in his series on Tropical Fungi.

217. *Meliola Hippocrateae* Doidge nov. spec.

Plagulae epiphyllae tenues, effusae. Mycelium reticulatum, ex hyphis brunneis, oppositè ramosis, rectiusculis v. leniter undulatis, 6-7 μ , raro usque 9 μ crassis compositum, Hyphopodia capitata sat numerosa, plerumque alternantia v. unilateralia, raro opposita, plerumque paullo antrorsum directa, cellula basali breviter cylindracea, 2.5-6 μ longa et 5-7.5 μ lata, apicali ovata v. cylindracea, 11-14 μ longa et 8-10 μ lata. Hyphopodia mucronata opposita v. unilateralia, ampullacea, plus minus curvata v. gibbosa, raro rectiuscula, 15-25 μ longa, e basi 5-7.5 μ lata subito in collum 7.5-15 μ longum et ca. 2.5 μ latum, rectum obliquum v. curvatum attenuata. Setae myceliales modice numerosa, praecipue juxta perithecia evolutae, 250-400 μ longae, ad basim 6-7.5 μ latae, atrobrunneae subopaeae, sursum sensim attenuatae ad apicem pellucidem vario modo denticulatae v. breviter furcatae dentibus plerumque 2-3, 5-7.5 μ longis v. bifurcatae ramulis usque 12.5 μ longis interdum denticulatis, vel irregulariter denticulatae v. incisae. Perithecia haud numerosa, globosa, atra, verrucosi, 150-170 μ diam. Asci non visi. Sporae oblongae, utrinque rotundatae, 4-septatae, plus minus constrictae, 37.5-45 \times 13-15 μ .

Hab. in foliis *Hippocrateae Schlechteri*, Karkloof prope Maritzburg, leg. Doidge, 14971.

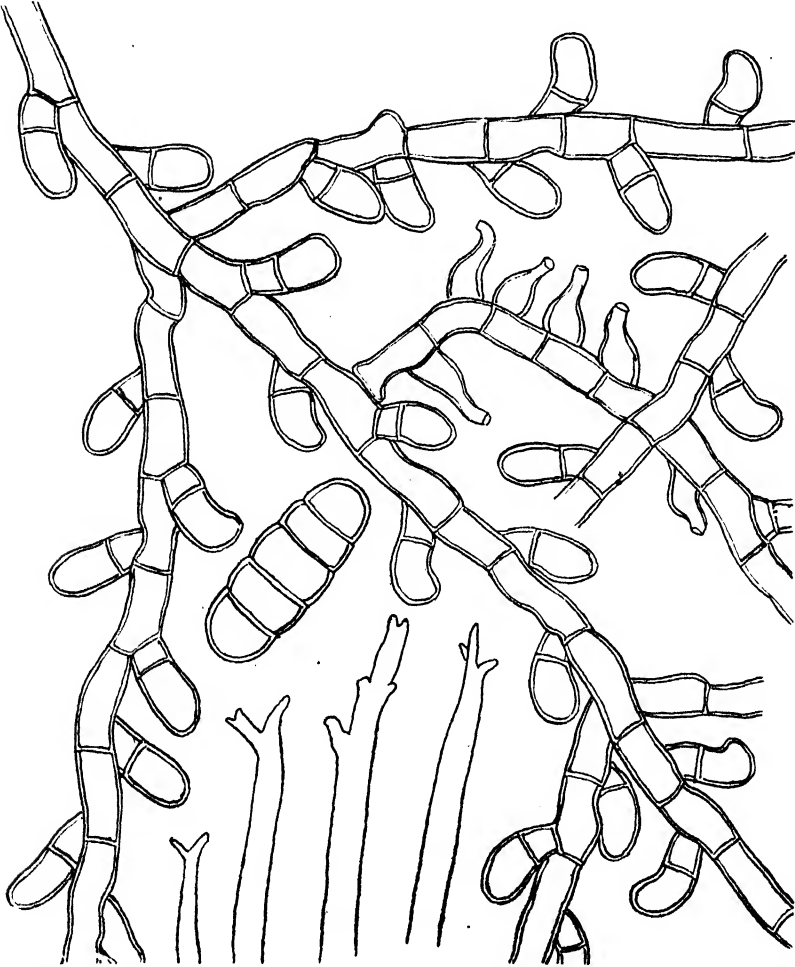


FIG. 2.—*Meliola Hippocrateae*, mycelium with capitate and mucronate hyphopodia; tips of mycelia setae; spores.

Colonies epiphyllous, thin, effuse. Mycelium reticulate; hyphae dark olive-buff to snuff-brown, straight to undulating slightly, $6\text{--}7.5\ \mu$ or occasionally up to $9\ \mu$ thick; cells $17.5\text{--}25\ \mu$ long; branching usually opposite. Capitulate hyphopodia fairly numerous, mostly alternate or unilateral; often alternate, with one hyphopodium to each cell of the hypha, occasionally opposite, $14\text{--}20\ \mu$ long, usually inclined towards the hypha; stipe cell cylindrical, $2.5\text{--}6\ \mu$ long, $5\text{--}7.5\ \mu$ broad; head cell ovate or occasionally cylindrical, $11\text{--}14 \times 8\text{--}10\ \mu$. Mucronate hyphopodia interspersed with the capitulate hyphopodia or on separate short branches, opposite or unilateral, or opposite a capitulate hyphopodium, ampulliform, more or less curved or gibbous, rarely almost straight, not paler than the hyphae, $15\text{--}25\ \mu$ long, $5\text{--}7.5\ \mu$ broad at the base, constricted suddenly into a neck which is $7.5\text{--}15\ \mu$ long and $2.5\ \mu$ thick. Mycelial setae not very numerous, more or less grouped in the neighbourhood of the perithecia, $250\text{--}400\ \mu$ long, translucent, snuff-brown at the tips, darker, sub-opaque and $6\text{--}7.5\ \mu$ thick at the base, tapering gradually upwards; tips simple, acute, or 2-3-dentate or bifurcate; teeth minute or $5\text{--}7.5\ \mu$ long, more or less symmetrical, or bifurcate, with branches up to $12.5\ \mu$ long, one branch sometimes bidentate; or asymmetrically dentate or notched.

Perithecia not numerous, black, globose, carbonaceous, $150\text{--}170\ \mu$ diam., cells of the perithecial wall slightly convex. Asci not seen. Spores 4-septate, oblong, broadly rounded at both ends, constricted at the septa, $37.5\text{--}45 \times 13\text{--}15\ \mu$.

on leaves of *Hippocratea Schlechteri* Loes., Karkloof, nr. Maritzburg, Doidge, 14971.

218. *Meliola Knysnae* Doidge nov. spec:

Plagulae amphigenae, atrae, sparsae, plus minus rotundatae, usque $2.5\ \text{mm.}$ diam., vel numerosae et conflundo majores. Mycelium reticulatum, ex hyphis copiose ramosis, brunneis, plus minus undulatis, $7.5\text{--}9\ \mu$ crassis compositum. Hyphopodia capitata alternantia, raro unilateralia, recta v. curvata, $25\text{--}37.5\ \mu$ longa; cellula basali subcylindracea, $6\text{--}12.5\ \mu$ longa, basi $5\text{--}6\ \mu$, ad septum $6\text{--}8\ \mu$ lata; apicali quoad formam variabili, $15\text{--}20\ \mu$ lata, plerumque 2-5-lobata. Hyphopodia mucronata pauca, pallidiora, $20\text{--}27.5\ \mu$ longa, e basi $7.5\text{--}8\ \mu$ crassa sensim in collo breve attenuata. Setae myceliales sat numerosae, sparsae, atrae, opacae, simplices, rectae v. plus minus flexuosae v. falcatae, plerumque $400\text{--}500\ \mu$ longae, inferne $5\text{--}9\ \mu$ crassae, sursum leniter attenuatae ad apicem obtusum $2.5\text{--}4\ \mu$ latam; apicem versus saepe leniter dilutiores et interdum plus minus torulosae. Perithecia (vix matura). sparsa, atra, globosa, verrucosa, $120\text{--}150\ \mu$ diam. Asci non visi. Sporae 3-septatae, oblongae, utrinque leniter attenuatae, plus minus constrictae, $50\text{--}58 \times 17.5\text{--}22.5\ \mu$.

Hab. in foliis *Ilicis mitis* in sylvis Knysna, leg. Doidge, 17210 a.

Colonies amphigenous, dull black, scattered, more or less circular, up to $2.5\ \text{mm.}$ diam., or numerous, becoming confluent and forming larger, irregular blotches. Mycelium reticulate, forming a more or less close network. Hyphae at first pale, fuscous, soon becoming buffy-brown, and older hyphae olive-brown, $7.5\text{--}9\ \mu$ thick, more or less undulating, cells $17.5\text{--}22.5\ \mu$ long, hyphae branching rather freely, branches alternate or irregular, usually emerging at an acute angle and tapering slightly at the junction with the main hyphae. Capitulate hyphopodia alternate, rarely unilateral, one to each cell of the hypha, or more remote and one to every second cell, straight, curved or abruptly bent, $25\text{--}37.5\ \mu$ long; basal cell sub-cylindrical, often tapering somewhat to the base, $6\text{--}12.5\ \mu$ long, $6\text{--}8\ \mu$ thick at the septum, $5\text{--}6\ \mu$ thick at the base, rarely gibbous; apical cell very variable in form, $15\text{--}20\ \mu$ broad, 2-5-lobed; lobes shallow, rounded or truncate, with sinus usually rounded, often broadly so. Mucronate hyphopodia rare, interspersed with the capitulate hyphopodia, slightly paler than the hyphae, narrow conical to sub-ampulliform with a short neck, $21\text{--}27.5 \times 7.5\text{--}8\ \mu$. Mycelial setae fairly numerous, scattered, black, opaque except near the apex, simple, straight, abruptly bent almost at right angles or more or less flexuous or falcate, mostly $400\text{--}500\ \mu$ long, $7.5\text{--}9\ \mu$ thick at the base, tapering gradually to a blunt tip $2.5\text{--}4\ \mu$ thick; sometimes slightly torulose near the apex through nodal swellings near the septa.

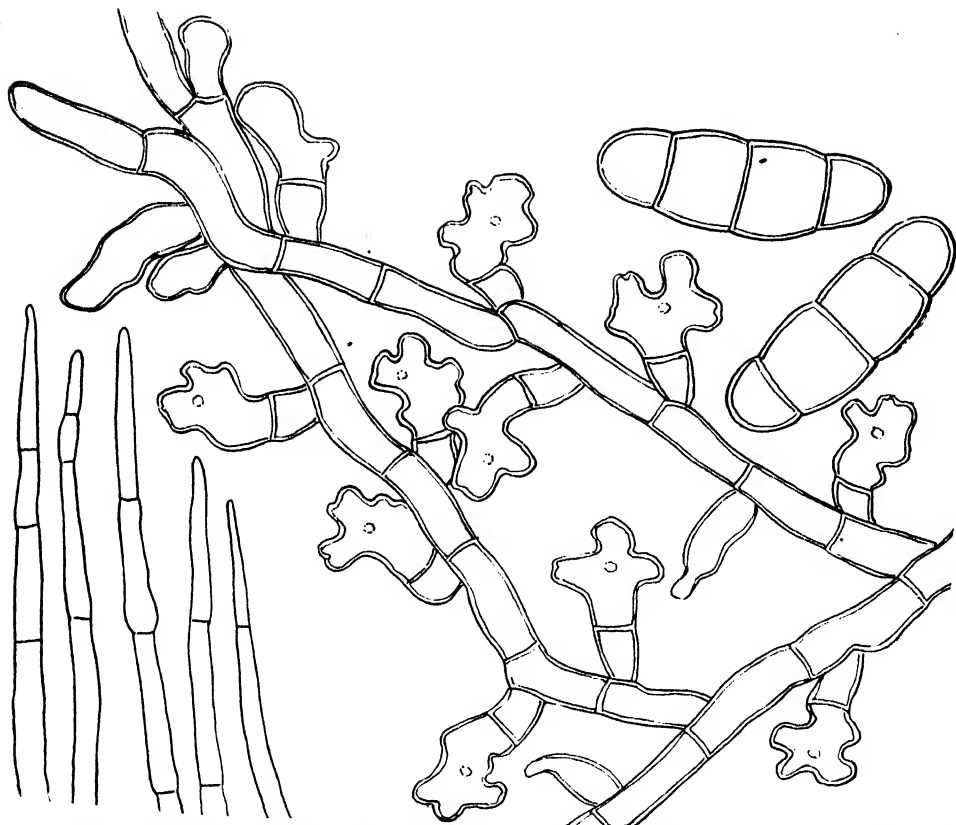


FIG. 4.—*Meliola Knysnae*, mycelium with capitata and mucronate hyphopodia; tips of mycelial setae spores.

Perithecia (not mature) scattered, black, globose, 120–150 μ diam.; outer wall composed of convex cells. The perithecia would probably be larger when mature. Asci not seen. Spore 3-septate, ellipsoid-oblong, tapering somewhat to broadly rounded ends, slightly constricted at the septa, 50–58 \times 17.5–22.5 μ .

on leaves of *Ilex mitis* (L.) Radlk., Deepwalls, Knysna, Doidge, 17210 a.

Hennings (Engl. Bot. Jahrb. 17, 1893, p. 523) has described a *Meliola* on *Ilex* from Brazil. It has 3-septate spores, 50–65 \times 18–21 μ , approximating in size those of *M. Knysnae*, and has hyphae 10–14 μ thick, considerably thicker than those of the fungus described above. Neither hyphopodia nor setae are mentioned in the original description, and no specimen was available for comparison.

219. *Meliola Oncinotidis* Doidge nov. spec.

Plagulae epiphyllae, sparsae, aeterrimae, plus minus rotundatae, 1–2.5 mm. diam. Mycelium ex hyphis reticulato-ramosis pellucide brunneis, 6–7.5 μ crassis, breviter articulatis, cellulis 15–25 μ longis compositum, ramis oppositis. Hyphopodia capitata numerosa, opposita, alternantia v. unilateralia, recta, rarius leniter curvata, 15–20 μ longa; cellula inferiore cylindracea, 3–5 μ longa, 6–9 μ lata, superiora ovata, rarius cylindracea, v. paullo irregulari, 12–15 μ longa, 6–9 μ lata. Hyphopodia mucronata modice evoluta, opposita v. unilateralia, haud pallidiore, ampullacea, recta v. gibbosa, 15–22.5 μ longa, basi 6–9 μ lata, subito in collum rectum v. curvatum, 5–9 μ longum et 2–4 μ latum attenuata. Setae myceliales numerosae, rectae v. plus minus curvatae, 250–500 μ longae, inferne 7.5–9 μ latae, obscure brunneae, subopacae, sursum pallidiores, pellucidae, sensim leniterque

attenuatae, ad apicem 5–6 μ latae interdum simplices obtusae, plerumque dentibus 2 mox brevibus 2.5–6 μ tantum longis mox elongatis tunc 12.5–47.5 μ longis praeditae. Perithecia in centro plagularum pauca, aggregata, globosa, atra, 150–220 μ diam., pariete e cellulis convexis composito. Asci 2-sporei. Sporae brunneae, oblongae, 4-septatae, utrinque rotundatae, constrictae, 39–45 \times 14–16 μ .

Hab. in foliis *Oncinotidis inandensis*, Zululand, leg. Gerstner, 33509.

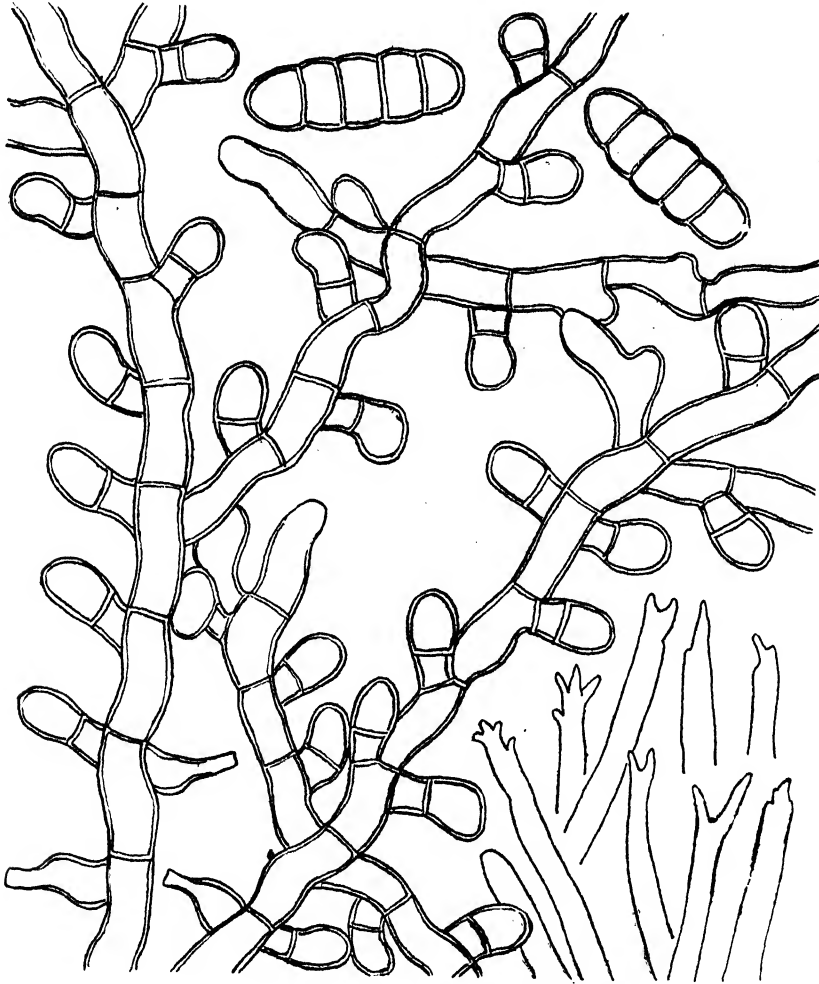


FIG. 5.—*Meliola Oncinotidis*, mycelium with capitulate and mucronate hyphopodia; tips of mycelial setae spores.

Colonies epiphyllous, dense, black, round, 1–2.5 mm. diam. Mycelium branching freely, becoming more or less closely reticulate, densely so in the centre of the colony. Hyphae deep olive-buff at the tips, becoming buffy-brown to tawny-olive, undulating, 6–7.5 μ thick, rather closely septate, cells 15–25 μ long, hyphae often narrowed somewhat near the septa. Branches usually opposite. Capitulate hyphopodia numerous, opposite, alternate or unilateral, at right angles to the hypha or inclined towards it at an acute angle, straight, rarely slightly curved, 15–20 μ long; stipe cell cylindrical, 3–5 μ long, 6–9 μ broad; head cell ovate, rarely cylindrical with rounded apex or somewhat irregular, 12–15 μ long, 7.5–10 μ broad. Mucronate hyphopodia interspersed with capitulate hyphopodia, opposite or unilateral, often opposite a capitulate hyphopodium, not paler than the hyphae, ampulli-

form, straight or gibbous, 15–22.5 μ long, 6–9 μ thick at the base, constricted suddenly into a curved or straight neck, 5–9 μ long and 2–4 μ thick. Mycelial setae numerous, straight or abruptly bent at the base, sometimes slightly curved, more or less translucent throughout or sub-opaque near the base, 250–500 μ long, 7.5–9 μ thick and buffy-brown to olive-brown at the base, tapering gradually upwards to 5–6 μ and becoming paler, deep to dark buff; apex sometimes simple with blunt tip, most frequently bifid with teeth 2.5–6 μ long, or with longer tapering branches, 12.5–47.5 μ long, sometimes minutely and irregularly 3–4-dentate.

Perithecia more or less closely grouped in the centre of the colony, black, globose, carbonaceous, 150–200 μ diam., surface cells convex. Asci 2-spored, evanescent. Spores snuff-brown, oblong, 4-septate, broadly rounded at both ends, constricted at the septa, 39–45 \times 14–16 μ .

on leaves of *Oncinotis inandensis* Wood and Evans, Zululand, *Gerstner* 2598, 33509; *Buccleuch* nr. Cramond, Natal, *Doidge*, 9722.

Material is unfortunately very sparse; on No. 9722, the *Meliola* is associated on the same leaves with *Asterina Oncinotidis*.

220. ***Meliola peddieicola*** Hansford.

Tropical Fungi I, Journ. Linn. Soc., London.

Colonies amphigenous, thin, dull black, effuse and irregular in outline. Mycelium loosely reticulate. Hyphae deep olive-buff at tips, becoming buffy-brown, slightly and

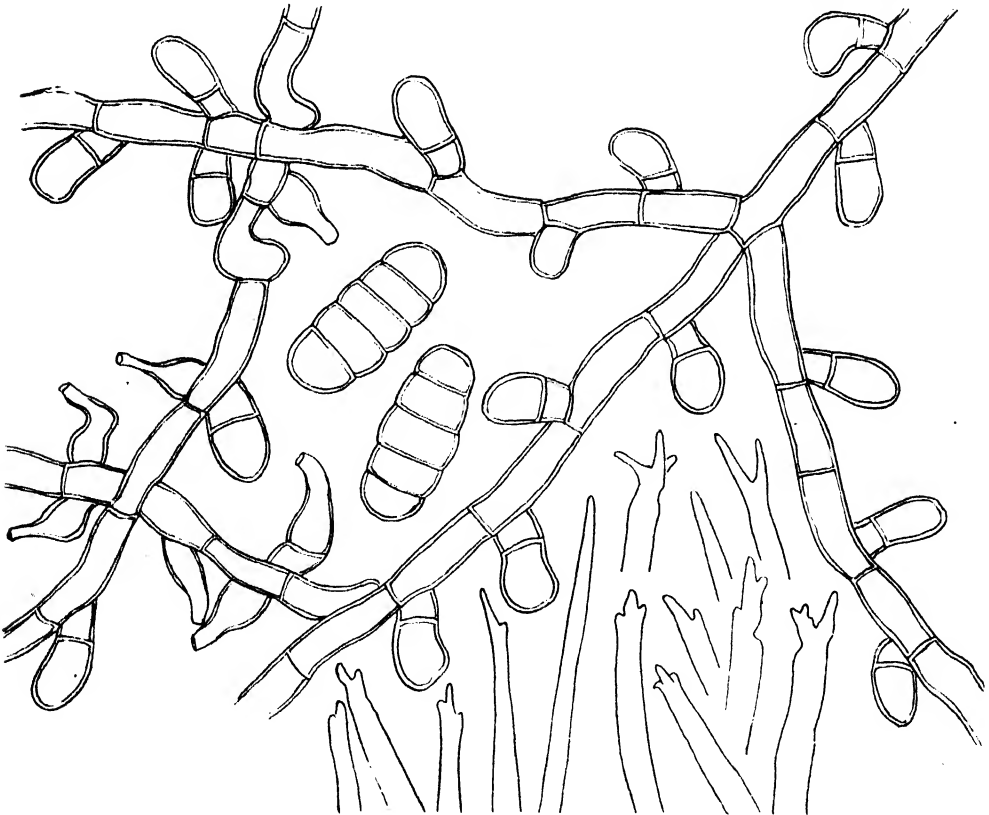


FIG. 6.—*Meliola peddieicola*, mycelium with capitate and mucronate hyphopodia; tips of mycelial setae; spores.

irregularly undulating, 5–7 μ thick, cells mostly 22·5–30 μ long. Capitate hyphopodia alternate, unilateral or occasionally opposite, straight or slightly curved, 17·5–22·5 μ long; stipe cell short, cylindrical, ca. 5 μ long and 5–6 μ thick; head cell 14–17·5 μ long and 7–10 μ broad, ovate or cylindrical. Mucronate hyphopodia not numerous, opposite, alternate or scattered, interspersed with the capitate hyphopodia and occasionally opposite to one of them, ampulliform, usually gibbous, rarely straight, 12·5–22·5 μ long, 6–7·5 μ broad at the base, constricted suddenly above into a neck which is 5–6 μ long and 2–2·5 μ thick. Mycelial setae not very numerous, mostly grouped round the perithecia, 300–450 μ long, straight but abruptly geniculate at the base, or slightly curved, olive-brown, sub-opaque and 7–9 μ thick at the base, tapering slightly and becoming somewhat paler towards the apex, which is translucent and buffy-brown; apex simple, acuminate, irregularly notched and toothed with usually 2–3 minute teeth, or definitely 2–3-furcate with branches 4–17·5 μ long; branches often uneven in length and one often bidentate.

Perithecia few, grouped in the centre of the colony, black, globose, carbonaceous, 130–160 μ diam., surface cells conical. Asci not seen. Spores 4-septate, cylindrical, not tapering or tapering very slightly to broadly rounded ends, slightly constricted at the septa, 35–39 \times 12·5–15 μ .

on leaves of *Peddiea africana* Harv., Woodbush, K. M. Putterill, 32465 b.

221. *Balansia Trachypogonis* Doidge nov. spec.

Pseudosclerotia in gemmis e foliis plerumque tribus constitutis evoluta, semper solitaria, recta v. arcuata, cylindracea compressa, 1–3 cm. longa, basi lata folio obsessa, in media parte 2–3 mm. crassa, apicem versus sensim attenuata, atra, intus albida. Stromata convexa, variae magnitudinis plerumque partem dimidiam inferiorem pseudosclerotiorum sine spatio occupantia, subinde etiam fere ad apicem sclerotiorum producta, tota superficie ob ostiola peritheciolorum dense minuteque verrucosa. Perithecia oblongo-lageniformia, immersa, dense stipata, e mutua pressione haud raro plus minus irregularia, 200–350 μ alta, 70–120 μ lata, superne subito in ostiola cylindracea v. anguste conica 100–130 μ longa attenuata; parietibus sub-hyalinis 12–16 μ crassis separata. Asci longe cylindracei, plerumque recti sed quandoque etiam curvuli, p. sp. 150–200 μ longi, ca. 5 μ lati, postice in stipitem tenuem attenuati, antice rotundati, tenuiter tunicati, ad apicem ca. 5 μ incrassati, 6–8-spori. Sporae tenuiter filiformes, longitudinem ascorum fere aequantes, 1·25–2·5 μ crassae, hyalinae, pluriseptatae, extra ascos facile in articulos secedentes.

Hab. in axillis foliorum semper ad nodos culmorum *Trachypogonis plumosi*, prope Pretoria, leg. Pole Evans, 9543 b.

Pseudosclerotia developing at the nodes of somewhat abnormal culms, which branch more freely than normal and have shorter internodes; often found at several successive, nodes.

The pseudosclerotium develops in the leaf axil, round a bud which usually consists of three leaflets; two of these, overlapping slightly, are closely adherent to the back of the sclerotium, against the sheath, the third, still more or less involute, is embedded in the fungous tissue. As the sclerotium develops, it may be straight, but frequently becomes arched, forcing the sheath away from the stem; it is flattened cylindrical or horn-shaped 1–3 cm. long, with broad base attached to the leaf sheath, 2–3 mm. broad in the centre, tapering gradually to the apex, which may be free or enveloped in the sheath, surface black, white within. Stromata develop on the exposed side, that is, facing the stem, they are convex and vary in size, often covering the lower half of the sclerotium and extending towards the tip.

Internally the sclerotium is white, consisting of very closely interwoven hyphae, 2–2·5 μ thick; this structure continues into the stroma, but at the surface of the latter, there is a firm, dark purplish-brown cortex, 25–30 μ thick, covering the perithecia.

Perithecia immersed, oblong-lageniform, crowded, often compressed laterally or even irregular in form through mutual pressure; total length 300–430 μ ; ascigerous part oval

to ellipsoid, 200–300 μ long, 70–120 μ diam., narrowed suddenly above into the ostiole. Ostiole cylindrical or narrow conical, straight or curved, not protruding, but fused with the cortex of the stroma, which is raised and hemispherical over the perithecium; ostiole traversed by a pore which is 15–20 μ broad at the base, 12–15 μ at the apex, lined with numerous hyaline periphyses. Perithecial wall almost colourless, not sharply differentiated from the stroma, but separating the perithecia by 15–20 μ . Asci numerous, long, cylindrical, rounded at the apex, tapering gradually at the base into a fine stalk, 6–8-spored, sp. part 150–200 μ long, ca. 5 μ thick, thin-walled, thickened at the apex to 5 μ . Spores hyaline, slender, filiform, almost equalling the ascus in length, 1.25–1.5 μ thick, pluriseptate, outside the ascus readily breaking into segments.

on *Trachypogon plumosus* Nees, Kaalfontein, *Pole Evans*, 9543 b, 9435, 10082, 28581; Johannesburg, *Bottomley*, 26607.

Urellytrum squarrosus Hack., near the old Standerton Road, *Pole Evans*, 8825.

? on *Andropogon amplexans* Nees, Meintjes Kop, *Mogg*, 25439.

Epichloe Volkensii P. Henn. [= *Ophiodothis Volkensii* (P. Henn.) Sacc.] described on *Exothea abyssinica* from tropical Africa is probably a *Balansia* sp., and may possibly be identical with the fungus described on *Trachypogon*. According to the description, the stromata are somewhat similar but smaller, up to 1 cm. long and 2 mm. thick, perithecia subglobose, asci cylindrical, spores filiform. No measurements are given and the type was not available for comparison.

222. *Epichloe cinerea* Berk and Br.

Journ. Linn. Soc. 14 (1875) p. 111 (Fungi of Ceylon No. 982).

? *Epichloe Zahlbruckneriana* P. Hennings, Ann. Nat. Hist. Hofmus. Wien (1900) p. 1; Sacc. Syll. Fung. XVI: 607.

Epichloe Eragrostis Pole Evans, Ann. Bolus Herb. 2 (1918) p. 110.

Stromata usually enveloping and destroying the whole inflorescence, but occasionally partly developed spikelets can be seen incompletely covered by fungous tissue. Stromata sub-cylindrical, tapering to the apex, usually 4–8 cm. long and 2–3.5 mm. thick; or some hosts, e.g. *Bewisia*, shorter, 2–3 cm. long. Stroma white within; surface grey, smooth or somewhat verrucose to the naked eye; with a hand lens, the surface appears most frequently ashen grey, occasionally darker, rarely smooth, when dry traversed by undulating and anastomosing, more or less longitudinal grooves; rather closely set with punctiform ostioles, which are more or less seriate on ridges between the grooves, convex, protruding, shiny black, round to oval.

The centre of the stroma consists of a close fungous tissue, consisting of closely interwoven, fine, hyaline hyphae; in this are included the broken-down remnants of host tissues, the vascular elements being more or less intact. Towards the periphery, the stroma tissue is slightly tinted, and near the surface forms a cortex of still closer texture, greyish-fuscescent to olive-grey in colour; there is a thin hyaline layer outside this cortex, which gives the stroma its characteristic grey colour.

Perithecia formed in large numbers in one layer near the periphery, flask-shaped, 250–350 μ long, including the ostiole, which is 90–100 μ long; ascigerous part ellipsoid to subglobose, 150–220 μ high, 90–170 μ broad. The ostiole protrudes slightly, but at the periphery is continuous with, and fused with the cortex of the stroma, which becomes convex at this point. Ostiole traversed by a pore, which is cylindrical or narrow conical, 25–40 μ broad at the base, 10–20 μ at the apex, lined with numerous hyaline periphyses. Asci fasciculate, cylindrical, rounded at the apex, tapering to the base, straight or curved, 6–8-spored, sp. part 90–175 μ long, 4–6 μ diam., mostly about 150 \times 6 μ , thin-walled, thickened at the apex. Spores filiform, slightly curved, very variable in length, 35–87.5 μ long, rarely more than

65 μ long, 1-1.25 μ thick, hyaline, 3-7-septate, tapering gradually to the apex and slightly to the base, readily breaking apart at the septa; the segments, which are often 20-30 μ long, are distinguishable from the shorter spores by their truncate ends.

on *Bewisia biflora* Goossens, Rietvlei, Pretoria district, *Murray and Acocks*, 30249;

Fountains Valley, *Mogg*, 11334; Kaalfontein, *Pole Evans*, 9543 a.

Ctenium concinnum Nees, Himeville, *Storey*, 32495.

Digitaria Brazzae Stapf, Marandellas, *Rattray* (Rh. 1855) 30111, det. *Mason*.

Digitaria diagonalis Stapf, Groenkloof, *Pole Evans*, 11871.

Eragrostis chloromelas Steud., Pretoria, *Pole Evans*, 9159.

Eragrostis curvula Nees, Umzimkulu, *Browne*, 9688.

Eragrostis plana Nees, Kentani, *Pegler*, 2076, 2139, 2190; Tabamhlope, *West*, 30519; Mooi River, *Mogg*, 10063, 10076; Bot. Gardens, Durban, *Kent*, 15455;

Moedig Siding, *Mainprize*, 28538; Tweedie, *Mogg*, 10066.

Eragrostis robusta Stent, Hopevale, *Morgan*, 27749.

Eragrostis sclerantha Nees, Donkerpoort, *Doidge and Bottomley*, 29761.

Eragrostis spp., Durban, *Baker*, 32016; Vereniging, *L. C. Turner*, 8977.

Microchloa caffra Nees, Groenkloof, *Pole Evans*, 11872.

Panicum natalense Hochst., Roberts Heights, *Mogg*, 33431.

Setaria nigrirostris Dur. and Schinz, Groenkloof, *E. P. Phillips*, 14248.

Sporobolus capensis Kunth., Acton Homes, *L. A. Doidge*, 25897; Eshowe, *Gerstner*, 28580; Lidgetton, *Mogg*, 11637; Thorneville Junction, *Doidge*, 865.

Tristachya Rehmanni Hack., Kaalfontein, *Pole Evans*, 9542.

on grass undet., Natal, *Medley Wood* 3959; Donnybrook, *Gordon*, 30790; Cramond, *Pole Evans*, 1369, 1395; Lidgetton, *Mogg*, 11639; Fairy Glen, *Lounsbury*, 17051; Skinner's Court, nr. Pretoria, *Pole Evans*, 745; Fountains Valley, *Mogg*, 11335; Orange Free State, *Nobbs*, 20910; Basutoland, *Dieterlen*, 11715, 18025; Mt. Insizwa, *Krook* (R. Penther 2205, Type of *Epichloe Zahlbruckneriana* P. Henn.).

Epichloe occurs in South Africa on a wide range of grass hosts, but has not been found on any species of the Andropogoneae, which form a large proportion of the indigenous grasses. Numerous collections have been examined, and 12 numbers on various hosts studied in detail. The fungus appears to be most common in Natal and the eastern part of the Cape Province on species of *Eragrostis* and on *Sporobolus capensis*; the latter host is often so severely affected that it is difficult to find a normal flowering head.

I am indebted to Mr. E. W. Mason for notes on collections of *Epichloe* from Africa in the herbarium of the Imperial Mycological Institute and in Kew Herbarium. In a letter dated the 4th April, 1943, he writes:—

"I have just compared this specimen (on *Digitaria Brazzae*, J. C. Hopkins, 1855) with three other specimens in our herbarium identified as above; they are (1) on *Sporobolus pyramidalis* from the Gold Coast; (2) on *Setaria aurea* from Kenya, and (3) on *Trichopteryx* sp. from Uganda (Maitland 470). They all seem to me identical in stromata, asci and ascospores with one another and with *Thwaites* 509 on *Eragrostis nutans* from Ceylon (in Herb. Kew) which is the type of *Epichloe cinerea* Berk and Br.

"Revised descriptions of the species have been given by Petch (Ann. Roy. Bot. Gard. Peradinya VI, Pt. 2, p. 173: 1916) from the co-type, and by Sydow and Butler (Ann. Myc. IX, p. 394: 1911) from Indian material, which, however, is not available here.

"I am not quite sure how the asci and spores should properly be described. In all the specimens, the asci vary in length from about 90-150 μ long, and are very close to

4 μ broad. In the shorter asci, the ascospores appear to be the length of the ascus, but free ascospores 150 μ long have not been observed. They are generally freed in portions 20–30 μ long, but this may be due to rough handling.

"From a note in our Herbarium, the asci of *Epichloe Eragrostidis* Pole Evans from South Africa (in Herb. Kew) on *Eragrostis plana* show about the same variation."

A careful examination of numerous spores from fresh material indicates that the spores are not as long as the ascus, as stated by Petch and by Sydow and Butler (l.c.) except possibly in the shorter asci; the maximum length observed was 87.5 μ . The hyaline, filiform spores are slightly twisted together in the ascus and it is impossible to measure the length accurately until they are free; they are rarely more than 65 μ long and taper slightly to both ends, more gradually to the apex; they are thus distinguishable from the segments with truncated ends.

No. 14248, on *Setaria nigrirostris* was listed by Doidge and Bottomley (Bot. Survey S. Africa. Memoir 11, p. 26 : 1931) as *Epichloe Zahlbruckneriana* P. Henn., a species described by Hennings (l.c.) from culms of an unidentified grass found in Griqualand East. The description of the stroma of this fungus does not differ in any essential from that of *Epichloe cinerea*; the asci are said to be 150–220 μ long, measurements which possibly include the sterile tapering base, in which case the sporiferous part would not exceed 175 μ in length; ascospores are said to be 0.5–0.8 μ thick, slightly thinner than the measurements given above, which were made from spores which had been immersed in 5 per cent. lactic acid. There is little doubt that *E. Zahlbruckneriana* is identical with *E. cinerea*, but unfortunately the type has not been available for comparison.

The conidial stage described by Hennings has not been observed, but Pole Evans' "stromatibus primo rubicundis conidiophoris" evidently refers to the conidia-bearing mycelium of *Fusarium ciliatum*, which is frequently found covering large areas of the *Epichloe* stroma.

223. *Neopeckia Caesalpiniae* Doidge nov. spec.

Perithecio in subiculo late effuso ex hyphis brunneis 4–5 μ crassis rigidis, longis, septatis, cellulis 15–20 μ longis, simplicibus, interdum paulum fasciculatis, rectis v. divergentibus vix repentibus insidentes; primo gregaria v. confertula, deinde densissime aggregata, obovoidea v. sphaeroidea, vel mutua pressione paulum irregularia, vertice applanata v. late rotundata, pilis rigidis, flexuosis saepe genuflexis, brunneis, ad apicem pallidioribus, hyphis mycelii similibus undique nisi ad apicem vestita, nigra, carbonacea, 350–500 μ alta, 280–360 μ diam. Asci numerosi, 8-spори, cylindricei, sursum rotundati, deorsum plus minus longe pedicellati, 100–125 \times 10–11 μ , p. sp. Sporae oblique monostichae, ellipsoideae, utrinque late rotundatae v. sensim attenuatae, 1-septatae, leniter v. vix constrictae, diu hyalinae demum fuscidulae, 16–24 \times 6–7.5 μ , cellulis subequalibus v. superiore brevioribus et latioribus. Paraphyses numerosissimae, filiformes, ramosae, ascos superantes.

Hab. in ramulis dejectis *Caesalpiniae sepiariae*, Town Bush Valley, leg. Doidge, 34480.

Subiculum developing and spreading on the wood, sometimes covering areas up to 2.5 cm. diam., consisting of long, rigid hyphae, olive-brown to buffy-brown, 4–5 μ thick and with cells 15–20 μ long, simple or somewhat fasciculate, straight or divergent, rarely creeping.

Perithecia may be based on decorticated wood, but, when the papery bark has not fallen, the subiculum penetrates to the surface and the perithecia develop on the bark. Perithecia from the first closely grouped, then becoming very densely crowded. They form an almost continuous crust which, if developed on the wood, extends over an area up to 2.5 \times 1.5 cm.; or, if on the bark, covering more restricted areas, usually 5–7 \times 3–6 mm. Perithecia black, carbonaceous, obovoid or globose, or slightly irregular through mutual pressure, broadly rounded or almost flat at the apex, cupulate when dry, 350–500 μ high, 280–370 μ diam. Except for the apex, the perithecial wall is clothed with rigid hairs, 25–150 μ , rarely up to 200 μ long, 4–5 μ thick, similar to the mycelial hyphae; they are

more numerous, and usually longer, towards the base of the perithecium, flexuous or geniculate; paler and more closely septate towards the apex, where they are rounded or slightly distended and subclavate ($5-6\ \mu$ thick). Ostiole flat, almost crateriform, or rarely very broadly truncate conical; the ostiole usually breaks away, and the broken edges form the rim of a flat, circular pore. Perithecial wall rough, consisting of several layers of flattened, polygonal cells, $4.5-12.5\ \mu$ diam., of which the outer layers are olive-brown, thick-walled and to which the hairs besetting the perithecium are attached. The inner layers are thin-walled, shading to dark olive-buff. The cells composing the ostiole are smaller.

The base of the perithecium is filled with a hyaline web of fungous tissue, of which the structure is not evident and on which the asci and paraphyses are borne. Asci numerous, 8-spored, narrow-cylindrical, straight or curved, rounded at the apex, tapering to a rather long foot at the base, sp. part $100-125 \times 10-11\ \mu$; wall tough, ca. $1\ \mu$ thick, slightly thickened at the apex, $2.5-3\ \mu$.

Paraphyses very numerous, hyaline, filiform, flexuous, branched, exceeding the asci.

Spores obliquely monostichous, variable in form, ellipsoid, sub-clavate or sub-fusoid, broadly rounded at both ends or tapering somewhat, 1-septate, slightly constricted at the septum or barely so, $16-24 \times 6-7.5\ \mu$. Cells sub-equal, or, in the sub-clavate spores, the upper somewhat shorter and broader than the lower; in clavate spores $20-22.5\ \mu$ long, the upper cell was $9-10\ \mu$ long and $7-7.5\ \mu$ broad, the lower $11-12 \times 6\ \mu$.

on fallen branches of *Caesalpinia sepiaria* Roxb., Town Bush Valley, Doidge, 34480.

224. *Englerula Macaranga* P. Henn.

Engl. Not. Jahrb. 34, p. 49 (1905).

Sacc. Syll. Fung. XVII: p. 529; Petrak, Ann. Myc. XXVI: p. 387 (1928).

Not on leaf spots; colonies hypophyllous, scattered, round to irregular in outline, up to 6 mm. diam., rarely larger. Mycelium ahyphopodiate, more or less reticulate; closely reticulate in the centre of the colony, loosely reticulate near the margin. Hyphae buffy-olive to olive-brown, translucent, more or less deeply undulating, seldom almost straight, $2-4\ \mu$ thick, main hyphae occasionally $5-6\ \mu$ thick; sometimes two or more hyphae running parallel from strands.

Perithecia develop in the centre of the colony, often in groups of two or more which may be closely crowded, remaining discrete or becoming fused at the base, sub-globose or globose-ovoid, without ostiole. When immature, perithecia are $30-40\ \mu$ diam., dark-olive-brown at the base, paler above, consisting of roundish angular, rather thick-walled cells $3.5-6\ \mu$ diam., seldom up to $7\ \mu$; at maturity becoming mucose-diffuent and swelling up to a diameter of $100-200\ \mu$. The wall becomes pale and translucent, and the asci are clearly visible. Asci few, usually 3-6, ovate, broadly clavate or oblong-ovate, broadly rounded at the apex, tapering slightly to the base which is sessile or apiculate and sometimes curved, 8-spored, wall tough and $2-2.5\ \mu$ thick, thickened ($5-10\ \mu$) at the apex, $60-80 \times 35-50\ \mu$. Spores distichous or imperfectly tristichous, oblong or oblong-clavate, broadly rounded at both ends, broader and more broadly rounded at the upper end, 1-septate, more or less constricted at the septum, long remaining hyaline, becoming buffy-olive; almost opaque, blackish-brown when mature, $25-36\ \mu$ long; cells equal length, the upper cell more or less ovoid, $15-17.5\ \mu$ broad, lower cell narrow ovoid or almost truncate conical and about $1-1.5\ \mu$ narrower than the upper.

Pycnidia (*Oothecium Macaranga* Petrak) round, very variable in size, mostly $30-100\ \mu$ diam., membrane becoming mucose-diffuent near the apex when mature. Conidia in smallest pycnidia single or few; more or less numerous in the larger pycnidia. Conidia ovoid, ellipsoid, almost globose or oblong-clavate, broadly rounded above, often tapering somewhat to the lower end, which is rounded to truncate, 1-celled, $20-35 \times 15-20\ \mu$, buffy-brown to blackish-brown, with a dark spot at each pole, surrounded by a paler, almost hyaline zone. The conidia germinate at the poles.

on leaves of *Macaranga capensis* Benth., Eshowe, Laughton, 34112.

This is a tropical African species, recorded from tropical East Africa and from the Belgian Congo. This is the first time that it has been found as far south as Zululand. The polar zone in the conidia seems to correspond with the equatorial pale or hyaline zone found in many *Asterostomella* conidia and in conidia of *Oothecium stylosporium* (Cke.) Doidge (*Bothalia* 4, Pt. 2, p. 327).

225. *Didymella zuluensis* Doidge nov. spec.

Perithecia ramulicola, in maculis subatris irregulariter circularibus v. oblongis, 1–2 mm. latis, subinde saepe confluentibus et longioribus gregarie innata, globoso-depressa, 120–170 μ diam., 90–112 μ alta, atra, epidermide quasi clypeiformiter denigratula tecta; ostiolo breviter conoideo haud prominulo 12–15 μ lato pertuso; pariete atro-brunneo, 10–12 μ crasso, contextu obscure parenchymatico. Asci numerosi, 8-spори, oblongi, firme crasseque tunicata, antice rotundati, sessiles v. brevissime pedicellati, 45–55 \times 6–7.5 μ . Sporae distichae, subfusoidaeae, utrinque leniter attenuatae, rotundatae, 1-septatae, haud constrictae, hyaline, 11–14 \times 3–4 μ .

Hab. in ramulis *Eugeniae zuluensis* in sylvis Xumeni, prope Donnybrook, leg. Morgan and Doidge, 29840.

Perithecia rather loosely grouped on twigs, immersed, covered by the epidermis, which becomes slightly convex and discoloured dark brown to black. The *perithecia* are thus grouped on dark spots which are at first irregularly round to oblong and 1–2 mm. diam.; these often become confluent, forming larger groups, which usually take the form of narrow, simple or branched, irregular ribbons running round the twig or diagonal to the axis.

Perithecia flattened globose, 120–170 μ diam., 90–112 μ high; the host tissue on either side of the *perithecia* is permeated by dark brown hyphae 2–2.5 μ thick and the cell walls are discoloured dark brown; the epidermal cells become black and opaque and almost clypeiform in appearance. Ostiole conical, not protruding, 25–45 μ long, ca. 35 μ broad at the base, at the apex opening by a more or less circular pore 12–15 μ diam. *Perithecial* wall dark brown, subopaque, 10–12 μ thick, obscurely parenchymatous, giving place suddenly within to a hyaline layer of equal thickness. Asci numerous, oblong, 8-spored, rounded above, tapering slightly at the base, sessile or very briefly pedicellate, with a firm thick wall, ca. 1 μ thick, slightly thickened at the apex, 45–55 \times 6–7.5 μ . Spores distichous, subfusoid, tapering slightly to rounded ends, hyaline, 1-septate, not constricted at the septum, 11–14 \times 3–4 μ ; cells equal in length or nearly so, but the upper cell is often slightly broader than the lower; spores conspicuously biguttulate.

on *Eugenia zuluensis* Dummer, on twigs, Xumeni Forest near Donnybrook, Morgan and Doidge, 29840.

226. *Leptosphaeria Pterocelastri* Doidge nov. spec.

Maculae amphigenae, rotundatae vel irregulares, 5–10 mm. diam., interdum majores, in pagina folii superiore cinerascetes margine olivaceo-brunneo limitatae, in inferiore avellaneae. *Perithecia* epiphylla sparsa, parenchymate immersa, epidermide tecta dein ostiolo papillato tenuissime prominula, globosa v. globoso-depressa, 200–250 μ diam., 125–185 μ alta, contextu parenchymatico, pellucido, olivaceo-brunneo, ex cellulis compressis 10–15 \times 2.5–5 μ composito. Asci octospori, cylindricei, recti v. curvati, apice rotundati incrassati, brevissime crasseque pedicellati, plerumque ex basi *perithecii* evoluti, 75–100 \times 7.5–10 μ , paraphysati. Sporae oblique monostichae, oblongae, utrinque late rotundatae, 2-septatae, rarissime 3-septatae, ad septa haud constrictae, rectae v. vix inaequilatae, olivaceae, 14–16 \times 6–7 μ .

Hab. in foliis *Pterocelastri tricuspidati*, Knysna, leg. E. M. Laughton, 35142.

Leaf spots dry, round to irregular in outline, often marginal, 5–10 mm. diam., occasionally larger; on the upper surface pale olive-grey with olive-brown border, avellaneous on the under side of the leaf.

Perithecia epiphyllous, scattered or subgregarious, innate in the mesophyll of the leaf, the apex of the ostiole only rupturing the epidermis, but barely protruding. Perithecia globose or flattened-globose, 200–250 μ diam., 125–185 μ high. Wall membranaceous, deep olive, ca. 10 μ thick at the base, consisting of several rows (four or more) of flattened, thin-walled cells 10–15 μ long and 2.5–5 μ thick, paler and less distinct in structure above. Ostiole deep olive at the apex, papillate or truncate-conical, lined with fine, hyaline periphyses, pore indistinct.

Asci 8-spored, arising from the base of the perithecium, cylindrical, straight or curved, rounded and slightly thickened at the apex and with a very short thick foot, 75–100 \times 7.5–10 μ . Paraphyses hyaline, exceeding the asci. Spores monostichous, slightly oblique, oblong, straight or somewhat asymmetrical, broadly rounded at both ends, often somewhat flattened at each pole, 2-septate, very rarely 3-septate, not constricted at the septa, 14–16 \times 6–7 μ , at first hyaline, then dark olive-buff, olive-brown when fully mature.

on leaves of *Pterocelastrus tricuspidatus* Sond., Knysna, *E. M. Laughton*, 35142.

Closely associated, on the same leaf spots, with *Pestalotia Pterocelastri* Laughton, and with other fungi.

227. **Mycosphaerella Agapanthi** (Kalchbr. and Cooke) Landau.

in Engler and Prantl, *Naturl. Pflanzenfam.* 1 Teil, 1 Abt. (1897) p. 427.

Sphaerella Agapanthi Kalchbr. and Cooke, *Grevillea* 9 (1880) p. 31.

Perithecia developing on leaf spots, which are at first light brown, poorly defined, scattered over the leaf surface, elliptic and up to 4 mm. long. The leaf spots increase in size and become smoke-grey as the perithecia develop, often running together, especially near the leaf tips and covering large areas of the leaf surface.

Perithecia closely and irregularly set in the leaf spots, shining black, round, punctiform, discrete or in small, close groups of 2–4, rarely more; developing under the epidermis and becoming more or less erumpent, flattened globose, 80–100 μ diam., 60–75 μ high; ostiole very short, 10–15 μ long, broadly and truncately conical, periphysate within and with a more or less round pore ca. 15–20 μ diam. Perithecial wall firm, membranous, composed of several layers of large, blackish-brown, pellucid, thin-walled, roundish-angular or somewhat elongated cells, 7.5–12.5 \times 7.5–10 μ ; the cells are compressed laterally to a thickness of 2.5–5 μ ; wall 7.5–12.5 μ thick at the base, sometimes only slightly thicker above, sometimes spreading out on either side to a radius of 30 μ just under the cuticle, and around the ostiole which protrudes only slightly. On the outside, the perithecial wall is connected with hyphae which penetrate right through the leaf tissues; these hyphae are fuscous, mostly 5–6 μ thick, frequently branched and septate and more or less tortuous. Within the perithecial wall, the ascigerous layer is quite hyaline.

Asci not very numerous, ovate or ellipsoid, straight or curved, rounded at both ends, often broader and more broadly rounded at the base and tapering somewhat to the apex, sessile or with a very short, knob-like foot, 8-spored; wall thin, 1 μ or less, but firm, slightly thickened (2–5 μ) at the apex. Spores distichous, hyaline, oblong or oblong-clavate, rounded at both ends, often slightly broader above, tapering slightly and gradually downwards, more or less equally 1-septate, not constricted at the septum or barely so, 15–20 \times 4–5 μ , mostly ca. 17.5 \times 5 μ .

on *Agapanthus africanus* Hoffm., on leaves, Kentani, *Pegler* 2366, 9167; Durban, *van der Byl*, 31954 a.

The original collection is *MacOwan* 1342, collected at Somerset East. The portion of this collection in the Pretoria herbarium is labelled *Pleospora herbarum* Rabenh.; unfortunately this material is in very poor condition and quite unfit for study. There are no asci nor spores, these having apparently been destroyed by bacteria, and even the perithecia

are partly broken down. The fungus has been re-described from No. 9167. The spores are somewhat larger than stated by Kalchbrenner and Cooke ($15-18 \times 3 \mu$), but possibly the material which they examined was not quite mature.

228. *Mycosphaerella Moelleriana* (Thuem.) Lindau.

in Engler and Prantl, *Naturlich. Pflanzenfam.* 1 Teil, 1 Abt. (1897) p. 425.

Perithecia on light brown or greyish-brown leaf spots, which are round to irregular in outline, up to 10 mm. diam., becoming dry and surrounded by a narrow raised margin of a darker brown. These spots are scattered, but often numerous, becoming coalescent and thus larger and very irregular in outline; in extreme cases the greater part of the leaf surface is involved.

Perithecia amphigenous, but mostly hypophyllous, usually very numerous, closely and irregularly grouped; less frequently only a few perithecia develop on each spot. Perithecia at first immersed, covered by the slightly raised epidermis, shining black, punctiform; later the epidermis ruptures and they are more or less exposed, or it remains covering the perithecia, which are then punctiform-erumpent only by means of a papillate ostiole. Perithecia minute, globose, $75-90 \mu$ diam. Perithecial wall $10-12 \mu$ thick, dark brown, membranous, composed of several layers of thin-walled, brown, polygonal cells, $5-10 \mu$ diam.; these are somewhat compressed laterally and ca. 2.5μ thick. Ostiole verruciform, not prominent in erumpent perithecia, papilliform in those which remain covered by the epidermis and up to 20μ long, $15-20 \mu$ broad and traversed by a more or less circular pore ca. 10μ diam. Asci fasciculate, obovate to obclavate, broadest near the base, tapering somewhat to both ends, but more definitely towards the rounded apex, 8-spored, sessile or sub-sessile, with a firm thick wall, $30-40 \times 12-15 \mu$. Spores distichous, oblong-clavate, hyaline, rounded at both ends, but more broadly rounded above and tapering gradually downwards, equally or sub-equally 1-septate, not constricted at the septum or barely so, upper cell somewhat broader than the lower, $10-13 \times 2-3 \mu$.

on *Eucalyptus gigantea* Dehnh., Hogsback, 20620.

Eucalyptus globulus Lab., Cedara, 26116, 26117, 26118, 26131; Natal Native Trust Forests, 26125; Hilton Road, 26127, 26128; Merrivale, 26129, 26130; Krugersdorp, 32202.

Eucalyptus Maidenii F. Muell., Birnham Woods, Merrivale, 26126; Berlin, Cape, 23664; Cedara, 26119; Jessievale, 26107.

Eucalyptus saligna Sm., Natal Native Trust Forests, 26123.

Eucalyptus Stuartiana F. Muell., Cedara, 26120.

Eucalyptus tereticornis Sm., Natal Native Trust Forests, 26124.

Eucalyptus sp., Harding, Wilding, 28787.

The above specimens were all collected by officers of the Forestry Department, the majority by the Forester at Cedara. A number of the collections show only immature perithecia, others are in good condition, the best material being Nos. 26112, 26123 and 26124. A collection on *Eucalyptus corynocalyx* F. Muell. and one on *Eu. maculata* Hook., both from Cedara, are probably the same fungus, but the perithecia are undeveloped. The characters and measurements of the fungus agree very closely with those given in the *Sylloge Fungorum* I: 491, a detailed study having been made of three collections in three different species of *Eucalyptus*.

In the South African Journ. Science 30 (1931) p. 227, *Mycosphaerella Moelleriana* is described by Verwoerd and du Plessis; they found the perithecia considerably larger (Perithecia $163-248 \mu$, asci $34-43 \times 6-7 \mu$ and spores $10-20.5 \times 3.4-4 \mu$). This form would appear to be intermediate between the typical *M. Moelleriana* and var. *megalospora* da Camara (Syll., Fung. XXII: 125) with asci $50-60 \times 18-20 \mu$ and spores $20-25 \times 6-8 \mu$.

According to observations made by Forest officers, *Eucalyptus globulus* is more susceptible to attacks by this fungus than other species. In December, 1930, it was noticed that leaf spots were very numerous in some stands of this species of *Eucalyptus* and that they were beginning to develop in others; at this time, some of the very young coppice shoots had been almost completely defoliated; by February the position was worse and there was much defoliation in the young coppice growth. The fungus attacked chiefly developed juvenile leaves; leaf spots were rare on leaves which still retained their juvenile glaucous covering and on semi-mature leaves; leaf spots develop rapidly on coppice growth after a rain or a few days of mist, especially if a spell of hot weather follows a good rain.

229. *Mycosphaerella Plectranthi* Doidge nov. spec.

Maculae amphigenae, sparsae, distinctissimae, orbiculares v. irregulares, saepe confluentes, pallide brunneae, usque 3.5 mm. diam. Perithecia semper epiphylla, pauca, irregulariter laxeque dispersa, sub epidermide evoluta, tandem sublibera, globosa, 75–85 μ diam.; ostiolo plano papilliformi tandem poro rotundo 10–12 μ aperto; pariete 5–10 μ crasso, e stratis 2–3-cellularum rotundato-vel irregulariter angulatarum pellucide olivaceo-brunnearum 5–7.5 μ diam., 2.5–4 μ crassarum composito, intus subito in contextum hyalinum fibrosum transeunte. Asci sat numerosi, ellipsoidei v. clavati, antice late rotundati, postice leniter attenuati, subsessiles v. breviter crasseque pedicellati, 8-spori, p. sp. 32.5–40 \times 7–9 μ . Sporae distichae, oblongo-fusoidae vel subclavatae, utrinque obtuse rotundatae, antice vix vel leniter, postice distincte attenuatae, rectae v. subrectae, circa medium septatae, vix constrictae, hyalinae, 10–13 \times 2–2.5 μ . Paraphyses haud visae.

Hab. in foliis *Plectranthi fruticosi*, in sylvis Knysna, leg. Bottomley, 32253.

Perithecia on leaf spots, which are very well defined, scattered or often confluent, visible on both sides of the leaf, round to irregular in outline, light brown, up to 3.5 mm. diam. Perithecia always epiphyllous, not numerous, irregularly scattered on the leaf spots and usually distant from one another, at first immersed, later becoming more or less free, globose, 75–85 μ diam.; ostiole short, flat, papilliform, 15–18 μ long, with a more or less round pore, 10–12 μ diam. Perithecial wall 5–10 μ thick; at the base consisting of 2–3 layers of angular, more or less round or irregular cells, pellucid olive-brown, 5–7.5 μ diam., somewhat flattened and 2.5–4 μ thick; towards the ostiole the wall is somewhat thicker. Asci fairly numerous, ellipsoid or clavate, straight or curved, broadly rounded above, tapering slightly to a briefly pedicellate base, 8-spored, sporiferous part 32.5–40 \times 7–9 μ . Spores distichous, hyaline, oblong-fusoid or sub-clavate, tapering very slightly to the upper end, more definitely to the lower end, more or less equally septate, very slightly constricted at the septum, upper cell often slightly broader, especially just above the septum, often slightly curved, 10–13 \times 2–2.5 μ . Paraphyses not seen.

on *Plectranthus fruticosus* L'Herit., on leaves, Knysna, Bottomley, 32253.

230. *Physalospora Sappi* Doidge nov. spec.

Perithecia amphigena, plerumque hypophylla, sine maculis sed decolorationes interminatas efficientia, laxe dispersa, epidermide oblecta, globoso-depressa, 100–150 μ diam., 85–100 μ alta, poro pertusa; pariete membranaceo variabile crassitudine, e stratis numerosis cellularum composito, cellulis sat compressis, rarius globoso-angulatis, 4–15 μ longis, 5–10 μ latis tenuiter tunicatis, extus brunneis intus hyalinis. Asci clavati, recti v. curvati, 8-spori, crasse tunicati (ca. 1.5 μ) ad apicem leniter incrassati, 2.5–3 μ , superne late rotundati, inferne sensim attenuati, breviter pedicellati, 40–50 \times 10–12.5 μ . Sporae distichae, hyalinae, fusoidae, continuae, utrinque obtusae v. truncatae, 12–15 \times 4–5 μ . Paraphyses paucae mox mucoae.

Hab. in foliis *Sappi reticulati*, Eshowe, leg. Laughton, 33543.

Perithecia amphigenous but mostly hypophyllous, not on leaf spots, but causing a vague discolouration of the leaf tissues, scattered, usually distant, at first completely immersed

and covered by the epidermis, which becomes raised and convex over the perithecia; later more or less erumpent. Perithecia flattened-globose, 100–150 μ diam., 85–100 μ high, at first closed, then opening by an apical pore, not papillate. Perithecial wall varying in thickness; outer wall 12.5–20 μ thick, composed of a few, usually 2–4, rows of indistinctly oblong, less frequently globose-angular, thin-walled, blackish-brown cells, 4–15 μ long and 5–10 μ broad; these give place internally to a number of rows of thin-walled, hyaline cells similar in form and finally to an indefinite concentric fibrose structure near the asci. Externally the perithecia are connected with rather sparse, smoke-brown hyphae, 4–6 μ thick, which penetrate between the cells of the host.

Asci 8-spores, clavate, thick-walled, ca. 1.5 μ thick, broadly rounded above and somewhat thickened, 2.5–3 μ , straight or curved, slightly attenuate to a pedicellate base, 40–50 \times 10–12.5 μ . Spores distichous, fusoid, continuous, hyaline, tapering more or less to obtuse or truncate ends, sometimes asymmetrical, 12.5–15 \times 4–5 μ . Paraphyses sparse, disappearing early.

on leaves of *Sapium reticulatum* (Hoschst.) Pax., Eshowe, E. M. Laughton, 33543.

231. *Pleospora Dyeri* Doidge nov. spec.

Perithecia irregulariter laxeque sparsa, plerumque solitaria, raro bina vel pauca aggregata, profunde immersa, depresso-globosa vel late ellipsoidea, 220–300 μ diam., 150–200 μ alta, ostiolo papillato vertice obtuso hyalino, 25–37.5 μ longo, poro irregulariter orbiculari 12–30 μ lato aperto punctiformiter erumpentia; pariete membranaceo, 17–25 μ crasso, parenchymatice c. pluribus stratis cellularum angulatarum pellucide brunnearum, 6–15 μ metientium composito. Asci sat numerosi, clavati, antice late rotundati, postice sensim attenuati, breviter stipitati, firme crasseque tunicati, 6–8-sporei, p. sp. 100–125 \times 40–45 μ . Sporae distichae, oblongae v. ellipsoideo-oblongae, antice late rotundatae v. subacutae, postice rotundatae, medio leniter constrictae, 7-septatae, cellulis 4–6 mediis septo quodam longitudinali praeditae, 42.5–50 \times 18–20 μ . Paraphyses vix numerosae, filiformes, hyalinae, ca. 1 μ crassae, mox mucosae.

Hab. in caulibus emortuis *Euphorbia triangularis*, prope Grahamstown, leg. R. A. Dyer, 23615.

Perithecia very widely distributed over the whole surface of the stem, which becomes light brown and dry, discrete or in more or less close groups of 2 or more, black, punctiform.

Perithecia deeply immersed, the epidermis becoming slightly raised and convex over each perithecium, flattened globose or broadly ellipsoid, 220–300 μ diam., 150–200 μ high. Ostiole hyaline, papillate, obtuse at the apex, 25–37.5 μ long, punctiform erumpent by means of an irregularly round pore 12–30 μ broad. Perithecial wall membranous, uneven outwardly where it is in close contact with the cells of the host and is connected with light fuscous to hyaline hyphae 2.5–4 μ thick, which penetrate into the stem tissues; wall 17–25 μ thick, composed of several layers of somewhat flattened, thin-walled, pellucid, purplish-brown, angular cells, 6–15 μ diam. Asci fairly numerous, up to about 16 in each perithecium, clavate, broadly rounded above, tapering gradually downwards and then constricted suddenly into a short, knob-like foot, 5–10 μ long and about 10 μ broad, with a firm wall, 1.5–2 μ thick, slightly thickened, 5–6 μ , at the apex, 6–8-spored, sp. part 100–125 \times 40–45 μ . Spores distichous, brown, oblong or ellipsoid-oblong, broadly rounded or subacute above, rounded below, at first transversely 3-septate and slightly constricted at the septa, then 7-septate; the central 4–5 cells become also longitudinally septate; spores 42.5–50 μ long, the upper half broader, 18–20 μ thick, the lower 15–18 μ thick. Paraphyses not very numerous, filiform, hyaline, ca. 1 μ thick, disappearing early.

on stems of *Euphorbia triangularis* Desf., near Grahamstown, R. A. Dyer, 23615.

232. *Anthostomella capensis* Doidge nov. spec.

Maculae magnae saepe apicales, plus minus effusae, usque 15 cm. longae, 1–2.5 mm. latae, pallide griseo-brunneae, linea marginali atrobrunnea limitatae. Perithecia amphi-

gena, plerumque epiphylla, hinc inde in greges variae magnitudinis irregulares laxè interdum seriatim disposita, omnino innata, profunde in mesophyllo immersa, vix vel leniter depressoglobosa, 140–240 μ diam., 110–150 μ alta, praecipue in epiphylo clypeo elliptico atrobrunneo usque 250 μ longo, pro maxima parte in epidermide formato tecta; ostiolo cylindraceo, 45–62.5 μ longo, 55–60 μ crasso, intus copiose periphysato poro rotundo ca. 20–25 μ lato pertuso, punctiformiter erumpentia; pariete membranaceo, 9–12.5 μ crasso, e pluribus stratis cellularum valde compressarum extus dilute flavo-vel olivaceo-brunneo intus omnino hyalinum composito, ad apicem clypeo connato. Asci sat numerosi, cylindracei, antice late rotundati, postice subito in stipitem brevissimum contracti, tenuiter tunicati, 70–95 \times 9–12 μ . Sporae oblique monostichae, oblongae v. ellipsoideae, utrinque haud vel vix attenuatae, late rotundatae, continuae, pellucide brunneae, sine appendiculis, 11–15 \times 6–7 μ , lateraliter compressae e latere visae 4–5 μ crassae. Paraphyses sat numerosae, filiformes, mox mucosae.

Hab. in foliis *Phoenixis dactyliferae*, Port Elizabeth, leg. Doidge, 1236.

On leaf spots, usually spreading from the tips of the leaves to a length of several centimetres (up to 15 cm.) and 1–2.5 mm. broad, pale greyish or greyish-brown, the discoloured area being surrounded by a dark brown line.

Perithecia mostly epiphyllous, in groups of varying shape and size, sometimes more or less seriate, completely immersed, occupying one-half to two-thirds of the thickness of the leaf. Perithecia globose or somewhat flattened-globose, 140–200 μ diam., 110–150 μ high; covered by a blackish-brown, elliptical clypeus, up to 250 μ long, developed chiefly in the epidermis. Ostiole broad, cylindrical, 45–62.5 μ long, 55–60 μ broad, copiously periphysate, punctiform erumpent by means of a pore 20–25 μ diam. and more or less round. Perithecial wall rather delicately membranous, 9–12.5 μ thick, formed of a number of layers of strongly compressed cells, outer layers pale yellow-brown or olive-brown, inner quite hyaline; at the apex fusing with the epidermal clypeus. Asci fairly numerous, cylindrical, broadly rounded above, at the base constricted suddenly into a very short foot, with a firm thick wall, 70–95 \times 9–12 μ . Spores obliquely monostichous, oblong to ellipsoid; not tapering to the rounded ends or very slightly so, brown, continuous, 11–15 \times 6–7 μ ; compressed laterally, 4–5 μ thick when seen from the side. Paraphyses fairly numerous, filiform disappearing early.

on leaves of *Phoenix dactylifera* Linn., Port Elizabeth, Doidge, 1236.

233. *Anthostomella Salaciae* Doidge nov. spec.

Perithecia longe lateque dispersa, decolorationes brunneas indeterminatas efficientia, greges minutes v. majores irregulares plerumque formantia, discreta vel connata, plus minus depresso globosa, saepe leniter irregularia, 250–400 μ diam., omnino innata, fere totam folii crassitudinem occupantia, in utraque pagina epidermidem leniter pustulatim elevantia, tantum ostiolo obtuse saepe truncato-conoideo vel vix cylindraceo 100–180 μ alto, in media parte 70–90 μ crasso, intus poro rotundo 20–25 μ lato pertuso, punctiformiter erumpentia; pariete firme membranaceo plerumque 20–30 μ crasso, e stratis numerosis cellularum irregulariter v. rotundato-angulatarum 2.5–5 μ diam. metientum, olivaceo-brunnearum, plus minus pellucidum, ad vertice obscure brunnearum composito, cum epidermide fere clypeiformiter connato. Asci numerosi, cylindracei, antice rotundati, postice plus minus attenuati stipitati, tenuiter tunicati, ad apicem leniter incrassati (4–5 μ), 8-spori, p. sp. 100–125 \times 10–12.5 μ . Sporae oblique monostichae usque subdistichae, oblongae, utrinque plerumque sat valide attenuatae, hinc saepe fusioideae, obtusae, haud appendiculatae, rectae v. inaequilatae, continuae, pellucide olivaceo-brunneae, plerumque 35–42.5 \times 5–7.5 μ . Paraphyses numerosae, filiformes, ca. 1 μ crassae, ascos superantes, sero mucosae.

Hab. in foliis *Salaciae Gerrardi*, Eshowe, leg. Laughton, 33546.

Perithecia distributed over large areas of the leaf surface, causing a rather vague brownish discolouration of the tissues, occasionally solitary, but more frequently in loose

irregular groups of 2 to 20, which are usually discrete but occasionally become confluent; groups of perithecia often in irregular series following the course of the veins of the leaf; the epidermis over the perithecia is greyish, with black pin points indicating the position of the ostioles.

Perithecia globose or flattened globose, often somewhat irregular in form, especially when in contact with a vein, 250–400 μ diam., completely immersed, occupying practically the whole thickness of the leaf and raising the epidermis on either side. Ostioles obtusely and often truncately conical, occasionally cylindrical, 100–180 μ long and 70–90 μ broad in the centre, copiously periphysate within, punctiform erumpent on the upper side of the leaf by a pore, which is usually 20–25 μ diam. Perithecial wall firmly membranous, formed of numerous layers of roundish angular or irregular cells 2.5–5 μ diam., olive-brown, more or less pellucid, darker and often sub-opaque at the apex where it fuses with the discoloured epidermis; clypeus round ostiole sometimes poorly developed. Asci numerous, cylindrical, straight or curved, rounded above, 8-spored, sporiferous part 100–125 \times 10–12.5 μ , tapering at the base to a stalk ca. 25–40 μ long; thin-walled, slightly thickened at the apex (4–5 μ). Spores obliquely monostichous to subdistichous, oblong or oblong-fusoid, tapering more or less to both obtuse ends, straight or somewhat asymmetrical, pellucid olive-brown, continuous, mostly 35–42.5 \times 5–7.5 μ , occasionally 45–50 μ long. An occasional ascus was seen with ellipsoid spores 17–22.5 \times 10–10.5 μ . Paraphyses numerous, filiform, about 1 μ thick, exceeding the asci.

on leaves of *Salacia Gerrardi* Harv., Eshowe, E. M. Laughton, 33546.

234. **Phyllachora eragrostidicola** Doidge nov. nom.

Phyllachora Eragrostidis Doidge, Bothalia IV : 430 (1942) non Chandon.

on *Eragrostis curvula* Nees, Mamathes, Basutoland, Hean, 32428; and on other *Eragrostis* spp.

The name *Phyllachora Eragrostidis* was given in 1939 to an American species by Chandon (Bol. Soc. Venez. Cien. Natur, 40 : 17). The original description has not been seen, but the species is recorded from North America by Orton in Mycologia 36 : 45, 1944. According to the description, the ascospores are 10–13 \times 4.5–6 μ , smaller than those of the South African fungus, which are 12–15 \times 6–7.5 μ .

235. **Diatrypella Morganae** Doidge.

Bothalia 4 (1941) p. 61.

on *Citrus sinensis* Osbeck, dead twigs of Valencia Late Orange, Mazoe, Bates (Bates 29 L/5/19 D) 33586.

The collection on citrus twigs cannot be distinguished from the type of *Diatrypella Morgani*, which was found on fallen wood in the indigenous forest in Natal. Part of the material on citrus is in excellent condition and the stroma better developed than in the type specimen.

For this collection and those cited under Nos. 235–237, I am indebted to Dr. G. R. Bates of the Citrus Experimental Station, Mazoe.

236. **Diatrypella natalensis** Doidge.

Bothalia 4 (1941) p. 60.

on *Citrus sinensis* Osbeck, twig of Valencia late Orange (Bates 29 T/10/16 A) Mazoe, 33583; branch of Valencia late Orange (Bates M/26 L/A) Mazoe, 33581.

This species was originally described from a branch of *Citrus nobilis* collected in Natal.

237. *Peroneutypella infinitissima* (Kalchbr. and Cooke) Doidge.

Bothalia 4 (1941) p. 64.

Valsa infinitissima Kalchbr. and Cooke, Greyvillea 9 (1880) p. 28.

on *Citrus sinensis* Osbeck, dead branch of Valencia Late Orange with bark, from Grove 26 L. Mazoe, Bates, 33587.

This collection is of interest; the fungus was previously known only from MacOwans' original collection "on dead branches of undet. tree", Somerset East, *MacOwan 1344 a*.

238. *Valsaria Batesii* Doidge nov. spec.

Stromata sparsa vel plus minus aggregata, in cortice immersa, fere tantum cum ostioliis fasciculatim coalitis erumpentia, ambitu plus minus rotundata, hemisphaerico-pulvinata, 0.5-1.5 mm. diam., valsoidea, inferne e hyphis brunneis 6-7.5 μ crassis composita, superne parenchymatice e cellulis atro-brunneis 3-5 μ v. usque 10 μ diam. metientibus composita. Perithecia 5-25 in quoque stromate, monosticha, in stromate omnino immersa, conferta, ovoidea, oblongo vel e mutua pressione saepe applanata et irregularia, 200-250 μ diam., 300-400 μ alta, superne subito in ostiola cylindracea, valde convergentia et apice in discum nigrum fasciculatim conjuncta attenuata; pariete 12.5-15 μ crasso, e pluribus stratis cellularum compressarum, pellucide olivaceo-brunnearum composito. Asci numerosissimi, cylindracei, p. sp. 75-85 μ longi, 9-10 μ lati, 8-spори. Sporae oblique monostichae, oblongae, utrinque late rotundatae, medio 1-septatae, haud vel vix constrictae, brunneae, leves, 9-14 \times 6-7.5 μ , plerumque 12.5 \times 6 μ . Paraphyses numerosissimae, hyalinae, filiformes, undulatae, ca. 1 μ crassae, ascos valde superantes.

Hab. in ramulis *Cinnamomi camphorae*, Salisbury, leg. G. R. Bates (Rh. 6762) 35296.

Stromata scattered or in small groups, immersed in the cortex, from which the apical disc becomes erumpent; or the bark may break away, exposing the stromata which remain seated on the decorticated wood.

Stromata usually hemispherical, black, pulvinate, with rough surface, 0.5-1.5 mm. diam., contracted suddenly above into a disc 500-800 μ diam., through which the convergent ostioles of the perithecia pass; verrucose at apex of disc, through the presence of slightly protruding, black-shining ostioles. Occasionally, in small stromata, there is a very short disc, and the common ostiole of the perithecia, covered only by the cortex of the stroma, protrudes about 500-600 μ ; occasionally, in larger stromata, the outer circle of convergent ostioles is only lightly covered in the disc and, with a hand lens, their course can be traced on the perimeter.

On the surface of the wood, there is a layer of horizontal hyphae, running parallel to the fibres of the host, extending far beyond the limits of the stroma and forming a black layer on the surface. They are dark olive-brown, 6-7.5 μ thick, frequently septate, with cells 10-25 μ long; these give rise to hyphae which penetrate into the wood and are paler near the surface, hyaline where they penetrate more deeply into the tissues of the host.

The basal part of the stroma, between the host and the base of the perithecia, 300-400 μ deep in the larger stromata, in the smaller sometimes only 75-100 μ , consists of a framework of horizontal hyphae, similar to those on the surface of the wood and running parallel to one another. The spaces between these main hyphae, usually narrow, but not infrequently wider and irregular in form, are filled with plectenchyma formed of paler, closely interwoven hyphae. At the margin of the stroma, the dark hyphae curve upwards, become closely interwoven and form, on the outside of the stroma and disc, a rather irregular, opaque black cortex, to which fragments of the cortical tissue of the host adhere. The upper part of the stroma consists of a dark, thin-walled pseudo-parenchyma of roundish or angular cells, 3-5 μ diam.; the cells of the disc are more loosely connected and become larger upward, up to 10 μ diam.

Perithecia 5–25 in each stroma, very closely crowded and not separated by stromatal tissue, circinate or arranged irregularly, oblong, ovoid or irregular in shape through mutual pressure, 300–400 μ high, 200–250 μ diam.; contracted suddenly above into cylindrical ostioles, which are 500–600 μ long—in smaller stromata occasionally up to 1,200 μ —strongly convergent, round to oval in section, 50–62.5 μ diam., lined with very numerous, ascending, fine hyaline periphyses. Ostioles usually becoming confluent, groups of 4–6 fusing into a common ostiole ca. 100 μ diam., expanding to ca. 150 μ at the apex, which is entire, not sulcate. Perithecial wall pellucid olive-brown, 12.5–15 μ thick, usually distinct from the stroma tissue and from the walls of adjoining perithecia, consisting of several layers of thin-walled, flattened cells 7.5–12.5 μ long, 2–2.5 μ thick.

Asci extremely numerous, lining the base and sides of the perithecial cavity, at sides reaching almost to the base of the ostiole, 8-spored, cylindrical, sp. part 75–85 \times 9–10 μ , not staining blue with iodine. Paraphyses very numerous, hyaline, persistent, filamentous, slender, undulating, ca. 1 μ thick, not staining blue with iodine. Spores obliquely monostichous, or oblique in the upper part of the ascus, vertical in the lower, oblong, broadly rounded at both ends, olive brown, 1-septate, not constricted or barely so, smooth, 9–14 \times 6–7.5 μ , mostly 12.5 \times 6 μ , cells equal or nearly so.

on twigs of *Cinnamomum camphora* Nees & Eberm., Salisbury, 1945, *G. R. Bates* (Rh. 6762) 35926.

239. **Valsaria Eucalypti** (Kalchbr. & Cooke) Sacc.

Syll. Fung. I (1882) p. 746; Doidge, *Bothalia* 4 (1941) p. 66.

Melogramma Eucalypti Kalchbr. & Cooke, *Grevillea* 9 (1880) p. 31.

on *Citrus maxima* Merr., on bark of Marsh grape fruit, unthrifty trees with incompatible bud unions (Bates P 22/A) Mazoe, 33588.

Prunus Armeniaca L., on bark, Pretoria, *C. P. v. d. Merwe*, 34120.

on dead branch of indigenous tree, Xumeni Forest, *Morgan & Doidge*, 34123.

The collection on *Citrus* shows no significant difference from the type on *Eucalyptus globulus* (Plate I.c.) The individual stromata are somewhat larger, and in structure they are rather more loosely woven; the stromatal hyphae are 2.5–3.5 μ thick near the perithecia and in the cortex, in the sterile part of the stroma they are 5–7.5 μ or even up to 8–10 μ thick; some thicker hyphae are also to be seen in the stroma of the type specimen of *V. Eucalypti*. Stromata on *Prunus* and on an indigenous tree are similar, on the latter host varying from small stromata like those of the type to large cushions up to 4 cm. long, 7 mm. broad and 5 mm. high.

Valsaria Eucalypti, with cinnamon brown, pulvinate stromata, is closely related to *V. Cinnamomi* (Ces.) Sacc.; the specimen of the latter species examined, on *Eugenia grandis* from Singapore (C. F. Baker, *Fungi Malayana* No. 496) 12164, is apparently part of the collection quoted in the *Sylloge Fung.* XXIV (1928) p. 764; it is very similar to the South African specimens, but the spores are consistently somewhat smaller, 10–11 μ long, spores of *V. Eucalypti* being predominantly 12.5–14 μ long, rarely 15 μ long as previously stated (Doidge l.c.); occasionally shorter spores 10–11 μ long are seen; spores 15 μ long are rare.

Valsaria hypoxylodes Rehm is another similar fungus, and according to Rehm (see Theissen, *Ann. Myc.* X: 12, 1912) is probably identical with *V. Cinnamomi*. The spores of *V. hypoxylodes* in the collection seen, from Porto Rico (Petrak, *Myc. Gen.* No. 100) 23336, are most frequently 14–15 μ long.

It has not been possible to examine type specimens of the two latter species, but it seems likely that there is only one rather variable species of *Valsaria* with the characters of *V. Cinnamomi*, namely pulvinate, cinnamon-brown stroma and verrucose spores without constriction at the septum. If this is the case, the correct name for the species would be *Valsaria Cinnamomi* (Ces.) Sacc., which was described by Cesati as *Melogramma Cinnamomi* in 1879.

240. *Protothyrium Tricalysiae* Doidge nov. spec.

Mycelium liberum nullum. Stromata amphigena, plerumque epiphylla, ambitu plus minus rotundata v. irregularia, usque 4 mm. diam., plana, crustacea, opace atra, ex hypostromate epidermali hyalino oriunda, pluries affixa. Hypothecium continuum planum fuscum, 5-6 μ crassum. Stratum tegens atro-brunneum, centro opacum, margine plus minus pellucide brunneum, ex hyphis subradiantibus vel fere maeandrice conjunctis, 4-6 μ crassis, cellulis 12.5-20 μ longis formatum. Asci numerosi, erecti, per stroma dense dispersi, haud in loculis collecti, ovati v. oblongo-clavati, antice late rotundati et incrassati, postice plus minus attenuati, sessiles v. subsessiles, firme tunicati, 8-spori, 50-60 \times 20-25 μ . Sporae distichae v. subdistichae, oblongae, v. oblongo-clavatae, basim versus leniter et sensim attenuatae, 1-septatae, haud vel vix constrictae, leves, diu hyalinae, tandem subhyalinae v. dilutissime olivaceo-griseae, 20-23 μ longae, cellula superiore 7.5-9 μ longa et lata, inferiore 12.5-15 μ longa ad septum ca. 7.5-8 μ lata.

Hab. in foliis *Tricalysiae lanceolatae*, Umtentweni, Natal, leg. Wager 32676.

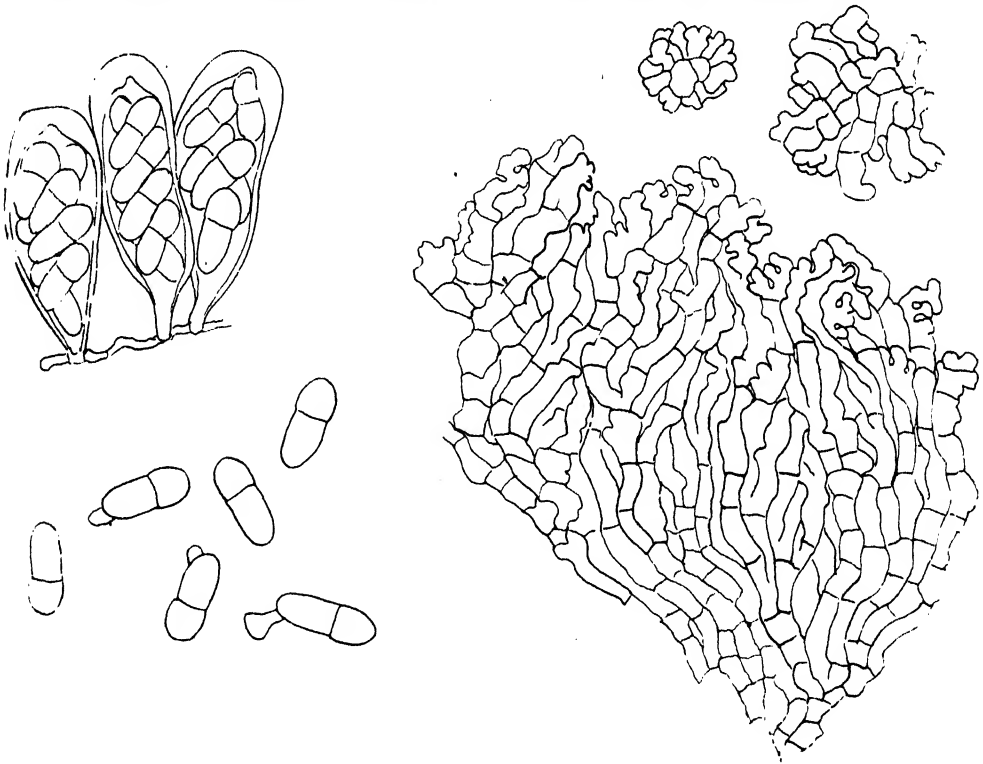


FIG. 7.—*Protothyrium Tricalysiae*, part of the edge of the covering membrane and two very young ascomata; asci; spores.

Free mycelium none. Stromata amphigenous, mostly epiphyllous, forming superficial crusts, more or less round to irregular in outline and up to 4 mm. diam., dull black, scattered, sometimes becoming confluent.

Covering membrane raised above the leaf surface to a height of 75 μ , flat at the margins. The central part is opaque black and structure not readily discernible; it consists of more or less radiating or winding rows of cells and at maturity cracks irregularly, breaking into uneven fragments; the margin of the covering membrane is irregular in outline and consists of irregularly radiating hyphae, which are more or less translucent, buffy-brown, tortuous and subtorulose, 4-6 μ thick with cells of uneven length, 12.5-20 μ long.

In contact with the cuticle of the leaf, there is a thin hypothecium, continuous throughout the stroma, deep to dark olive-buff and apparently consisting of a single layer of cells $5-6\ \mu$ thick. This is connected at many points, through the cuticle, with the hyaline epidermal hypostroma, which consists of closely interwoven hyphae $2.5-3\ \mu$ thick, filling the epidermal cells under the whole external stroma. From the epidermal hypostroma, fine hyphae penetrate more deeply into the leaf. Not infrequently a second stroma develops on the under side of the leaf, opposite to that on the upper surface; this seems to indicate that the mycelium may penetrate through the leaf without extending laterally to any distance.

The hypothecium gives rise to very numerous asci, which are not grouped in loculi, but stand erect in the stroma. There are no definite paraphyses between the asci and the structure of the intervening tissue is not readily discernible; it is brownish, and shows traces of a thread-like structure, having apparently broken down early into an almost structureless, greyish-olive, mucous mass.

Asci ovate to oblong-clavate, 8-spored, broadly rounded above, usually tapering slightly or more decidedly to the base, occasionally obovate and broader at the base, sessile or with a short, peg-like foot, with a firm wall, thickened round the apex to $5-6\ \mu$, $50-60 \times 20-25\ \mu$. Spores more or less distichous, oblong or oblong-clavate, broadly rounded above, tapering gradually and slightly towards the rounded base, 1-septate, not constricted or very slightly so, smooth, long remaining hyaline, slightly tinted, smoke-grey at maturity, $20-23\ \mu$ long: upper cells shorter and broader, $7.5-9\ \mu$ long and broad, lower $12.5-15\ \mu$ long, ca. $7.5-8\ \mu$ broad at the septum and tapering somewhat downwards; often germinating from the basal end in the ascus.

The stomata readily become detached from the leaf, or the central part may fall away, exposing somewhat discoloured leaf tissues surrounded by the margin of the stroma.

on *Tricalysia lanceolata* Schum., on leaves, Umtentweni, Wager 192, 32676; Louis Trichardt, V. A. Putterill, 11825; Woodbush, Doidge, 1782; Eshowe, Laughton, 33554.

The earlier collections of this fungus were immature.

241. *Cyclotheca Bosciae* Doidge.

Bothalia I, Part 4 (1924), 196.

The type specimen of this fungus is in rather poor condition, and spores examined were not quite mature; they are said to be hyaline, $11.6-13.3 \times 8.3\ \mu$; the figure for width, $8.3\ \mu$, is obviously a clerical error, 5.3 being intended.

A more recent collection on the same host provides more abundant and more mature material; the spores become fuscous when fully ripe and are $12-16 \times 5-6\ \mu$. This fungus has also been found in the north-eastern Transvaal on *Maerua Legatii* Burt Davy.

In the genus *Cyclotheca* the spores are hyaline; this fungus with light brown spores must therefore be transferred to the genus *Hysterostomella* and becomes:—

Hysterostomella Bosciae Doidge nov. comb.

Syn. *Cyclotheca Bosciae* Doidge l.c.

on *Maerua racemulosa* (A.P.DC.) Gilg. and Ben. (= *Boscia caffra* Sond.), Ebb and Flow, Wilderness, Doidge, 17125, Type; Knysna, Laughton, 32839.

Maerua Legatii Burt Davy, near Olifants River on the road from Tzaneen, Pilgrims Rest Distr., Scott, 34028.

The genus *Hysterostomina*, differs from *Hysterostomella* only in the presence of paraphyses in the mature ascomata, a character now not admitted as a generic distinction. *Hysterostomina* spp. must therefore be included in the genus *Hysterostomella* and the following South African fungi are affected by the change in nomenclature:—

242. **Hysterostomella tenella** Syd.

Ann. Myc. 10 (1912) p. 442.

Hysterostomina tenella Syd. in Theissen and Sydow, Ann. Myc. 13 (1915) p. 228.
on *Asparagus striatus* Thunb., Despatch, Doidge, 1241.

243. **Hysterostomella Oxyanthae** Doidge nov. comb.*Hysterostomina Oxyanthae* Doidge, Bothalia 2 (1927) p. 232.

Morenoella Oxyanthae Doidge, Trans. Roy. Soc. S. Africa 8 (1920) p. 286.
on *Oxyanthus Gerrardi* Sond., Woodbush, Doidge, 1758, 17725, 28340.

244. **Hysterostomella opaca** (Syd.) Doidge nov. comb.*Hysterostomina opaca* Syd., Ann. Myc. 22 (1924) p. 429.on *Olea foveolata* E. Mey., Knysna, van der Byl 1397, 2280.

The genus *Palawania* was characterised by Sydow [Phil. Journ. Sci. (C) Botany, Vol. IX (1914) 171 and Ann. Myc. 13 (1915) p. 249] as follows:—

“Stromata superficialia, carbonacea, radiato-contexta, ex hypostromate subepidermali per stromata erumpenti oriunda, hypothecio tenui. Loculi rotundati, discreti. Asci paraphysati, octospori. Sporae phaeodidymae.”

Two species were described.

Palawaniella [Doidge, Bothalia I (1921) p. 16] was said to differ from *Palawania* in the centrifugal arrangement of the stromata and in the epidermal rather than sub-epidermal hypostroma.

Hansford has re-examined the two species of the genus *Palawaniella* and reports that: “In *Palawaniella orbiculata* (Syd.) Doidge, the hypostroma consists of dark hyphae filling individual epidermal cells and connected with the ascoma by fine filaments and with each other by hyaline hyphae through and below the epidermis; a few hyphae penetrate into the sub-epidermis.”

“In *Palawaniella Dovyalidis* Doidge, the hypostroma is similar to that of *P. orbiculata* but with more penetration of the palisade tissue by the sub-epidermal hyphae.”

It is obvious that the degree of penetration of the tissues by the hypostroma cannot be maintained as a generic distinction, nor is the centrifugal development of the stromata of any great significance. As indicated by Hansford (I.M.I. No. 15, 1946, p. 168.) in his key to genera of the *Polystomellinae*, the genus *Palawaniella* Doidge should be united with the genus *Palawania* Sydow, which consists of species with 2-celled, coloured spores and ascomata attached at several points, hymenia under distinct scutella and irregularly arranged; there is no free mycelium.

The synonymy and host range of the South African species would then be as follows:—

245. **Palawania orbiculata** (Syd.) Doidge.*Seynesia orbiculata* Syd., Ann. Myc. 10 (1912) p. 39.*Palawaniella Eucleae* Doidge, Bothalia I (1921) p. 16.*Hysterostomina Eucleae* (Doidge) van der Byl, S. Afric. Journ. Sci. 22 (1925), p. 192.*Palawania Eucleae* (Doidge) Nel, Ann. Univ. Stellenbosch XX A 2 (1942) p. 22.*Palawaniella orbiculata* (Syd.) Doidge, Bothalia IV (1942), p. 329.

on *Euclea lanceolata* E. Mey., Piesanghoek, Bosman, 25868; Rooiwal, Bosman, 29922.

Euclea macrophylla E. Mey., Howieson's Poort, Doidge, 12375.

Euclea natalensis A.DC., Letaba Drift, Doidge, 1808; New Agatha, 11384;
Nelspruit, Liebenberg, 29910.

Euclea racemosa Murr., Cape Flats, *Dippenaar*, 33885.

Euclea spp., Knysna, *Bottomley* and *Laughton*, 32248; Grahamstown, *Otto* (Stell. 348).

246. **Palawania Dovyalidis** (Doidge) Nel.

Ann. Univ. Stell. XX A 2 (1942), p. 22.

Palawaniella Dovyalidis Doidge, *Bothalia* I (1924), p. 98.

on *Dovyalis rhamnoides* Harv., The Wilderness, *Doidge*, 17117; Bathurst Distr., *Doidge*, 12347; Knysna, *Laughton*, 32267, v. d. *Byl* 2297; George, *Verwoerd* (Stell. 347).

The genus *Byliana* *Dippenaar* [Ann. Univ. Stell. VIII, A 2 (1930), p. 31, Illustr. 3] is said to differ from *Palawaniella* in its darker hypothecium and scattered stromata. As indicated above, the arrangement of the stromata does not seem to be of any great significance; the hypostroma of *Byliana Halleriae* is similar to that of *Palawania orbiculata*. The colour and thickness of the hypothecium can hardly be regarded as a generic character. It is proposed, therefore, that the genus *Byliana* be united with *Palawania*. The species on *Halleria* then becomes:—

247. **Palawania Halleriae** (Dipp.) Doidge nov. comb.

Byliana Halleriae *Dippenaar*, Ann. Univ. Stell. VIII (1930), p. 32.

on leaves of *Halleria lucida* Linn., Bloukransrivier, v. d. *Byl* 2496, 33592; Knysna, *Verwoerd* (Stell. 345).

I am indebted to Dr. *Dippenaar* for the opportunity of examining the type specimen.

248. **Asterodothis solaris** (Kalchbr. and Cooke) Theiss.

The genus *Asterodothis* was established by *Theissen* [Ann. Myc. 10 (1912), p. 179] for the fungus described by *Kalchbrenner* and *Cooke* [*Grevillea* 9 (1880), p. 35] as *Asterina solaris* on *Olea verrucosa*.

In *Annales Mycologici* 13 (1915), p. 232, *Theissen* and *Sydow* cited as a synonym *Lembosia Albersii* P. Henn. on *Elaeodendron*; the latter specimen has not been seen, but in *Bothalia* I (1921), p. 10, the writer included a number of collections of a fungus on *Elaeodendron* under this species. The spores are similar and there is a general resemblance in habit, but a more careful study shows that the fungus on *Cassine* (= *Elaeodendron*) is not *Asterodothis* but a dense form of the fungus described by *Sydow* as *Asterinella dissiliens* and later transferred to the genus *Asterina* [*Bothalia* IV (1942) p. 287] because of the presence of hyphopodia. (See also *Hansford*, l.c. p. 190.).

It seems that in South Africa at least, *Asterodothis solaris* occurs only on species of *Olea*; the organs described as hyphopodia in some instances and in others regarded as rudimentary setae or bristles, are conidiophores. There are no true hyphopodia on the mycelium of *A. solaris*.

249. **Polyrhizon Pterocelastri** Doidge nov. spec.

Stromata amphigena, plerumque epiphylla, irregulariter laxaeque sparsa, sine maculis, ambitu sat regulariter orbicularia, 1–4 mm. diam., raro confluyendo irregularia et majora, e pluribus ascomatibus irregulariter circinantibus concreta, ex hypostromate subepidermale ubique sub stromate evoluta oriunda. Ascomata partialia dense conferta, orbicularia, usque 800 μ diam., pede centrali 35–60 μ lato, atrobrunneo, epidermide innata, strato tegente intense et opace atra, ad peripheriam e hyphis radiantibus subtortuosius leniter undulatis, 4–5 μ crassis contexto. Hypothecium fuscum, minute cellulosum. Loculi pauci, annulati circa pedem ordinati, 80–100 μ alti, 150–300 μ diam. Asci sat numerosi, ovati v. ellipsoidei, raro clavati, antice late rotundati, sessiles v. brevissime pedicellati, 8-spори,

66–80 \times 22.5–38 μ . Sporae distichae, intense olivaceo-brunneae, oblongo-clavatae utrinque rotundatae, 1-septatae, constrictae, 27.5–33 μ longae, cellula superiore ellipsoidea, 15–16.5 μ longa, 10–12.5 μ lata, inferiore oblonga v. subcuneata 12.5–16.5 μ longa ad septum 7.5–10 μ lata. Paraphyses persistentes filiformes, ascos superantes, ca. 1.5 μ crassae, ad apicem clavato incrassatae usque 2.5 μ latae.

Hab. in foliis *Pterocelastris Galpini*, Kromrivier, leg. Doidge et Bottomley, 32776.

Mycelium almost entirely sub-epidermal, composed of hyphae 2–2.5 μ thick; these become much branched and closely interwoven, forming an extensive and more or less dense hypostroma in the palisade cells; from the hypostroma, hyphae grow out and penetrate into the mesophyll of the leaf, often reaching the lower epidermis. The hypostroma becomes particularly dense in the sub-stomatal cavity; here it becomes blackish-brown and emerges through the stomata to the leaf surface at many points. These form the starting points of the partial stromata which develop centrifugally in round, crowded groups.

The compound stromata are mostly epiphyllous, scattered, 1–4 mm. diam., rarely confluent. The individual or partial stromata are round, up to 800 μ diam., with a blackish-brown, opaque central foot, 35–60 μ broad, connecting with the hypostroma. The covering membrane is deep black, opaque, carbonaceous and very brittle; at the sterile margin, which lies flat on the leaf surface or overlaps that of a neighbouring partial stroma, the radiating structure is more or less evident; it consists of radiating, pellucid brown, branching, somewhat undulating, tortuous hyphae, 4–5 μ thick. Hypothecium ca. 15–20 μ thick, fuscous to olive-brown, minutely cellular.

Loculi few, arranged in a circle round the central foot, 80–100 μ high in the centre, 150–300 μ diam. Asci fairly numerous, ovate or ellipsoid, rarely clavate, broadly rounded above, sessile or very briefly pedicellate, 8-spored, 66–80 \times 22.5–38 μ . Spores distichous, deep olive-brown when mature, clavate-oblong, rounded at both ends, 1-septate, deeply constricted, 27.5–33 μ long; upper cell ellipsoid, 15–16.5 μ long and 10–12.5 μ broad; lower oblong or subcuneate, 12.5–16.5 μ long, 7.5–10 μ broad just below the septum and tapering somewhat downwards. Paraphyses persistent, filiform, exceeding the asci, about 1.5 μ thick, up to 2.5 μ thick at the clavate tips.

on *Pterocelastrus Galpini* Loes., Kromrivier, Rustenburg Distr., Doidge and Bottomley, 32776.

The two species of *Polyrhizon* previously described on South African hosts are *Polyrhizon Bewsii* Doidge on *Cassine* spp., and *P. Celsi* on *Gymnosporia acuminata* Szysz.; all three species occur on host genera belonging to the family *Celastraceae*.

250. *Echidnodes Curtisiae* Doidge nov. spec.

Epiphyllum, maculas orbiculares, sparsas, sat regulares, plerumque acute marginatas usque 7 mm. diam., in epiphyllis brunneis, zonula angusta atro-brunnea cinctas, in hypophyllo decolorationes flavo-brunneolas efformans. Mycelium intramatricium profunde in mesophyllum penetrante, hypostromate fusco subepidermale efformans. Plagulae epiphyllae in centro maculae parum perspicuae. Mycelium liberum parce evolutum ex hyphis radiantibus laxe reticulatis, olivaceo-brunneis, sub-rectis v. curvatis, obscure septatis, 2.5–5 μ plerumque 4 u crassis compositum. Hyphopodia pauca, sparsa, continua, subglobosa v. pyriformia, 4–5 μ alta et lata. Thyriothecia pauca in centro maculae laxe dispersa, linearia, recta v. curvata, 350–1,000 μ longa, 150–200 μ lata, strato tegente convexulo, atro-brunneo, in parte centrali opaco, marginem versus ex hyphis radiantibus 2–3 μ crassis composito, margine haud fimbriato, rima longitudinali dehiscentia, membrana basali olivaceo-brunnea ex cellularum sat indistinctarum composita hypostromate subepidermali pluries affixa. Asci ovati sessiles, 8-spores, 30–33 \times 15–17.5 μ . Sporae conglobatae, brunneae, oblongae v. subclavatae, utrinque rotundatae, 1-septatae, leniter constrictae, 15–17 \times 5–6 μ .

Hab. in foliis *Curtisiae fagineae*, Deepwalls, Knysna, leg. Bottomley, 32131 a.

Causing scattered, more or less circular leaf spots, up to 7 mm. diam.; on the upper side of the leaf these are seal-brown with blackish-brown border; on the under side they are paler, army-brown to buffy-brown.

In the discoloured areas, the mycelium penetrates deeply into the host tissues. Light-brown hyphae, beneath the thyriothecia, form a sub-epidermal plate, which is connected with the basal membrane of the thyriothecia at many points by hyphae passing through the stomata, or between the epidermal cells and through the cuticle.

Superficial mycelium epiphyllous, rather sparse, radiating from the centre of the leaf spot, loosely reticulate, dark olive-brown to buffy-brown, almost straight or more or less curved, obscurely and rather frequently septate, uneven in thickness, $2.5-5\ \mu$ thick, mostly $4\ \mu$. There are a few scattered hyphopodia, 1-celled, sub-globose or oval to pyriform, $4.5\ \mu$ high, $4-5\ \mu$ broad.

Thyriothecia epiphyllous, few, in the centre of the leaf spot and of the superficial mycelium, linear, $350-1,000\ \mu$ long, straight, curved or bent, $150-200\ \mu$ broad, $60-65\ \mu$ high in the centre. Covering membrane black, opaque, except at the margin, where it is formed of radiating hyphae, $2-3\ \mu$ thick; margin irregular but not fimbriate; dehiscing at maturity by an irregular, longitudinal fissure almost the length of the covering membrane. Basal membrane olive-brown, structure obscure. Asci ovate, sessile, 8-spored, $30-33 \times 15-17.5\ \mu$. Spores conglobate, buffy-brown, sub-cylindrical to sub-clavate, rounded at both ends, 1-septate, slightly constricted at the septum, $15-17 \times 5.6\ \mu$; loculi sub-equal in length or the upper slightly shorter and broader, the upper loculus sub-ovate, broader near the septum, the lower cylindrical. When the spores germinate, a hyphopodium is formed near the septum.

on leaves of *Curtisia faginea* Ait., associated with *Meliola ganglifera* Kalchbr., Deepwalls, Knysna, A. M. Bottomley, 32121 a.

Although a few hyphopodia are present, the extensive internal mycelium seems to place this fungus in the genus *Echidnodes*; compare Hansford's notes on *Lembosia durbana* v. d. Byl (Bothalia IV, p. 820.)

251. ***Echidnodes transvaalensis*** Doidge nov. sp.

Plagulae epiphyllae, atrae, sparsae, ambitu irregulares, usque ca. $2.5\ \text{mm}$. diam., haud acute definitae. Mycelium ex hyphis plus minus undulatis, dilute olivaceo-brunneis, indistincte septatis, $2-2.5\ \mu$ crassis compositum. Thyriothecia plerumque dense dispersa, haud raro dense conferta, oblonga, recta v. curvata, $200-420\ \mu$ longa et $80-100\ \mu$ lata, rima longitudinali dehiscencia, vel orbicularia, $80-125\ \mu$ diam.; strato basali tenui, subhyalino; strato tegente convexulo, pellucide brunneo, ex hyphis radiantibus $2-3.5\ \mu$ crassis, cellulis $3-5\ \mu$ longis composito, peripherice plus minus fimbriato. Asci numerosi, 8-sporei, ovati, sessiles, forme tunicati, $22.5-35 \times 10-12.5\ \mu$. Sporae subdistichae v. conglobatae, oblongae v. oblongo-clavatae, antice late rotundatae, postice leniter attenuatae, 1-septatae, haud vel vix constrictae, leves, dilute olivaceo-brunneae, $10-12.5 \times 4-5\ \mu$, cellula inferiore plerumque leniter angustiore.

Hab in foliis *Eugeniae natalitiae*, Mariepskop, leg. Scott, 34027.

Colonies epiphyllous, scattered, thin, dull black, irregular in outline, poorly defined, up to $2.5\ \text{mm}$. diam. Mycelium delicate, radiating irregularly and becoming loosely reticulate, ahyphopodiate. Hyphae light greyish-olive or greyish-olive to dark olive-buff, $2-2.5\ \mu$ thick, more or less undulating, not infrequently running parallel to one another and forming loose strands of 2 or 3 hyphae; branching irregular; septation obscure and rather distant.

Thyriothecia fairly numerous, crowded in irregular groups, often becoming confluent; single thyriothecia linear oblong, straight, curved, bent at almost a right-angle or forked, $200-420\ \mu$ long and $80-100\ \mu$ broad, dehiscing by an irregular longitudinal crack, running almost the whole length of the covering membrane; or more or less circular in outline, $80-125\ \mu$ diam., dehiscing by irregular cracks radiating from a central pore. Basal membrane delicate, structure not evident. Covering membrane slightly convex, at first dark olive-buff, becoming olive-brown, more or less pellucid, but sub-opaque in the centre;

composed of radiating hyphae $2\text{--}3.5\ \mu$ thick, with cells $3\text{--}5\ \mu$ long; margin more or less fringed, the fringing hyphae not differing from those of the mycelium.

Asci very numerous, ovate, broadly rounded above, sessile or with a short peg-like foot, 8-spored, $22.5\text{--}35 \times 10\text{--}12.5\ \mu$, with a firm wall slightly thickened round the apex. Paraphyses breaking down early into an olivaceous mass without recognisable structure. Spores imperfectly distichous to conglobate, 1-septate, oblong to oblong-clavate, greyish-olive, $10\text{--}12.5 \times 4\text{--}5\ \mu$, smooth, not constricted at the septum or barely so, broadly rounded above, tapering somewhat to a rounded base; loculi more or less equal in length, but the upper slightly broader than the lower.

on leaves of *Eugenia natalitia* Sond., Mariepskop, Pilgrims Rest district, *E. Scott*, 34027.

This fungus, which is very similar in habit to *Lembosia Wageri* Doidge, is very closely associated, on the same leaves with *Asterina natalitia* Doidge.

252. *Morenoina Dracaenae* Doidge nov. spec.

Epiphylla, maculas rufo-brunneas ellipticas v. suborbiculares usque 10 mm. longas, 6–8 mm. latas efficiens. Mycelium liberum nullum, intra-matricalium subcuticulare, radiante ex hyphis hyalini. v. fuscis, $2\text{--}4\ \mu$ crassis septatis cellulis $5\text{--}15\ \mu$ longis compositum. Ascomata numerosa, densiuscule et centrice dispersa, haud raro 2–3 dense conferta et plus minus connata, primitus ambitu orbicularia vel elliptica, mox elongata oblonga, recta v. curvata, $170\text{--}500\ \mu$ longa, $150\text{--}200\ \mu$ lata, $70\text{--}85\ \mu$ alta, primo clausa dein rima longitudinale dehiscentia; strato tegente convexulo, opace atro-brunneo, marginem versus radiatim contexto ex hyphis $2.5\text{--}4\ \mu$ crassis contexto, peripherice copiose brevique fimbriato; strato basali subhyalino, $3\text{--}4\ \mu$ crasso. Asci 8-sporei, ovati, $30\text{--}35 \times 22\text{--}25\ \mu$ v. oblongo-clavati $40\text{--}50 \times 15\text{--}20\ \mu$, antice late rotundati, deorsum sensim attenuati sessiles. Sporae distichae v. imperfecte tristichae, oblongo-clavatae, utrinque late rotundatae, leves, 1-septatae, constrictae, diu hyalinae tandem olivaceo-brunneae, $20\text{--}22.5\ \mu$ longae, cellula superiore ovata, $9\text{--}10\ \mu$ longa, $6\text{--}7.5\ \mu$ lata, inferiore oblonga v. basim sensim attenuata, $11.5\text{--}12.5\ \mu$ longa $5\text{--}6\ \mu$ lata.

Hab. in foliis *Dracaenae Hookerianae*, Durban, leg. P. A. van der Byl (v. d. Byl 328).

The fungus causes reddish-brown leaf spots on the upper side of the leaf; these are elliptic to sub-circular in outline, up to 10 mm. long and 6–8 mm. broad. On the under side of the leaf there is no discolouration of the tissues, but they are concave under the leaf spots.

There is no superficial mycelium, but the thyriothecia are attached either in the centre, or at several points, to a sub-cuticular mycelium. This takes the form of sub-cuticular plates, one cell thick, hyaline to dark olive-buff and buffy-brown. It consists of straight or curved hyphae, $2.5\text{--}4\ \mu$ thick, with cells $5\text{--}15\ \mu$ long and rather frequently branched; through repeated branching the hyphae, which are fused by their lateral walls, form a radiating fan-shaped structure at the edge of the colony.

Ascomata epiphyllous, developing in concentric rings, very numerous, often crowded and becoming coalescent in groups of 2–3 or more; at first round to elliptic in outline, becoming oblong to oblong-linear, rounded at both ends, straight, curved or bent, $170\text{--}500\ \mu$ long, $150\text{--}200\ \mu$ broad, $70\text{--}85\ \mu$ high in the centre. Covering membrane convex, blackish-brown, opaque, visibly radiating in structure towards the margin, briefly and densely fimbriate, consisting of hyphae $2.5\text{--}4\ \mu$ thick; at maturity splitting down the centre to form a longitudinal fissure running almost the length of the covering membrane; less frequently developing radiating cracks. Basal membrane sub-hyaline, $3\text{--}4\ \mu$ thick; structure not evident. Asci numerous, 8-spored, ovate, $30\text{--}35 \times 22\text{--}25\ \mu$, or oblong-clavate, $40\text{--}50 \times 15\text{--}20\ \mu$, the ovate asci being near the margin of the ascomata and the more elongated asci near the centre. Asci broadly rounded above, more or less tapering to the base, sessile, thin-walled, slightly thickened, up to $5\ \mu$, round the apex. Spores distichous or imperfectly tristichous, clavate-oblong, broadly rounded at both ends, smooth, long remaining hyaline, becoming dark olive-buff to buffy-brown, 1-septate, constricted

at the septum, 20–22.5 μ long; upper cell ovate, 9–10 μ long, 6–7.5 μ broad; lower cell oblong or tapering slightly downwards, 11.5–12.5 μ long, 5–6 μ broad; the cells separate rather readily at the septum.

on leaves of *Dracaena Hookeriana* K. Koch, Durban, *van der Byl* 328.

253. **Bulliardella capensis** Doidge nov. spec.

Hysterothecia erumpenti-superficialia, carbonacea, sparsa vel gregaria, elliptica v. rotundata, utrinque obtusa, 400–750 μ longa, 400–500 μ lata, extus atra subnitentia rima longitudinali percursa, haud carinata. Asci 6–8 spori, cylindracei v. clavati, apice rotundati, tenuiter tunicati, 125–150 \times 20–30 μ , paraphysibus filiformibus, ramosis. Sporae recte v. oblique distichae, olivaceae, cylindraceae, utrinque rotundatae, 1-septatae, medio leniter constrictae, 47.5–52.5 \times 11.5–13 μ , loculo superiore longiore et lenissime latiore.

Hab. in ramulis *Gymnosporiae procumbentis*, Qolora, Transkei, leg. M. Gunn, 24136.

Hysterothecia scattered or more or less gregarious, erumpent to superficial, carbonaceous, shining black, elliptic to circular in outline, 400–750 μ long, 400–500 μ broad; flattened elliptic in section and about 350 μ high; traversed by a narrow longitudinal fissure, lips level or slightly incurved, not ridged. Walls thick, opaque, 50–75 μ thick at base and sides, becoming thinner above. Asci numerous, 6–8-spored, cylindrical to clavate, broadly rounded above, tapering at the base, or constricted abruptly into a short peg-like foot, thin-walled, 125–150 \times 25–30 μ . Paraphyses delicate, filiform, branched. Spores subdistichous, parallel or oblique, grayish-olive to buffy-brown, cylindrical, rounded at both ends, 1-septate, slightly constricted at the septum, straight or slightly curved, 47.5–52.5 \times 11.5–13 μ ; upper cell longer than the lower and slightly broader, cylindrical or broadening slightly above the septum, 26.5–29 μ long; lower cell tapering somewhat to the base; loculi separating readily at the septum.

on twigs of *Gymnosporia procumbens* Lees., Qolora, Transkei, M. Gunn, 24136; closely associated with *Lecanora* sp. and with other lichens; an immature hysterothecaceous fungus with longer ascomata and muriform spores was also found on the same twigs.

In "Observations on Species of *Bulliardella*" (Papers of Mich. Acad. Sci. Arts and Letters, Vol. 23, 1938, pp. 155–61) Lohman mentions five species of *Bulliardella*, of which four were previously known in Europe; the fifth *B. nitida* (Ellis) Lohman is a North American species. With the exception of *B. sphaerioides*, found in Europe and North America on *Betula*, all are conifer-inhabiting fungi and all are comparatively small spored, with spores less than 20 μ long and 7 μ broad. There appears to be no previous record of this genus in the southern hemisphere. The spores of *B. capensis* are sometimes deeply constricted at the septum and the cells sub-pyriform in shape, very similar in form to those of *B. sphaerioides*, but they are much larger.

254. **Bulgariastrum africanum** Syd.

Ann. Myc. 13 (1915) p. 42.

Ascomata amphigenous and caulicolous, not on definite leaf spots, but causing an indeterminate, yellow-brown discolouration of the leaf tissues, very closely crowded in round groups, which are up to 5 mm. diam., or occasionally becoming confluent and irregular; not infrequently interspersed with conidiiferous stromata in the same groups; the latter are black, more or less round, pulvinate, the surface rough with many fissures and folds. The ascomata are sub-turbinate, at first gelatinous, hard and horny when dry; disk waxy in appearance, with a raised black border. (Plate I a and b.)

The mycelium penetrating the tissues of the host is similar in character and extent to that of *Bulgariastrum bullatum*, but the internal stroma and the base of the external stroma is lime-green in colour and is translucent. The stroma is 250–350 μ broad at the base, expanding rapidly upwards; it may be simple, bearing one disk, branching to produce two or three disks, or with ascoma and conidia on one stroma. The ascoma expands rapidly upwards to a height of 400–500 μ , the expanded disk being slightly concave or slightly

convex, varying from $300\ \mu$ to $1,000\ \mu$ in diameter; disk normally round, but in closely crowded groups it becomes elliptic through mutual pressure.

The central part of the stroma is lime-green, parenchymatous in texture and composed of cells $12\text{--}18\ \mu$ diam., with a cortex of smaller cells, $7\text{--}12\ \mu$ diam., dusky blue-green in colour and externally rough and loosely connected.

Asci clavate, rounded above, 8-spored, $60\text{--}90 \times 14\text{--}16\ \mu$. Spores obliquely monostichous or incompletely distichous, hyaline, ellipsoid-oblong, 1-septate, not constricted at the septum or slightly so, rounded at both ends, $12\text{--}15 \times 6\text{--}7\ \mu$; cells equal or nearly so. Paraphyses filiform, thicker ($3\text{--}4\ \mu$) at the clavate tips, exceeding the asci and forming a dense, dusky green-blue epithaecium.

The conidiiferous stroma is similar in structure to the ascoma, but pulvinate in form. Under the cortical cells cavities develop, $200\text{--}300\ \mu$ diam. and $200\text{--}300\ \mu$ high; the surface of the cavity, on all sides, is lined with conidiophores, which are simple, straight or slightly curved, cylindrical, ca. $10\text{--}13\ \mu$ long and $2\text{--}2.5\ \mu$ thick. Conidia borne singly at the tips of the conidiophores, hyaline, mostly clavate, rarely ellipsoid, straight or slightly curved, not tapering or tapering slightly to the rounded apex, tapering gradually towards the base, $11\text{--}25 \times 3\text{--}5\ \mu$; at first 1-septate, then 2–3-septate, often slightly constricted at the septa.

on *Capparis Rudatisii* Gilg. and Ben., Somerset East, MacOwan 1273 b, 20814; East London, Doidge, 12395.

The type specimen (Sydow l.c.) was collected by *Rudatis* 1388 at Friedenau in Natal.

The conidial form is:—

Oncospora viridans Kalchbr. and Cooke.

Grevillea IX (1880), p. 19.

Nannfeldt, Nov. Act. Reg. Soc. Sc. Upsala, Ser. IV, Vol. 8 (1932), p. 86.

Sphaeropsis abnormis Berk and Thuem. in Thuem. Myc. Univ. No. 1675.

Ephelis viridans (Kalchbr. and Cooke) Sacc. Syll. Fung. III (1884), p. 691.

Sphaeropsis enormis Sacc., Syll. Fung. X (1892), p. 254.

The host of MacOwan's collections was said to be *Capparis Gueinzii*, but a careful comparison with authentically named specimens shows that it is *C. Rudatisii*; ascomata are present on the portion of the type collection of *Oncospora viridans* (MacOwan 1273 b) in the Pretoria herbarium. Conidia have also been found on:—

Capparis Rudatisii Gilg. and Ben., Olifantshoek, Uitenhage, MacOwan (*Sphaeropsis abnormis* in Thuem. Myc. Univ. 1675); Alexandria, Doidge, 22373.

Ascomata are formed more freely than those of *Bulgariastrum bullatum*, which is usually found in the conidial stage.

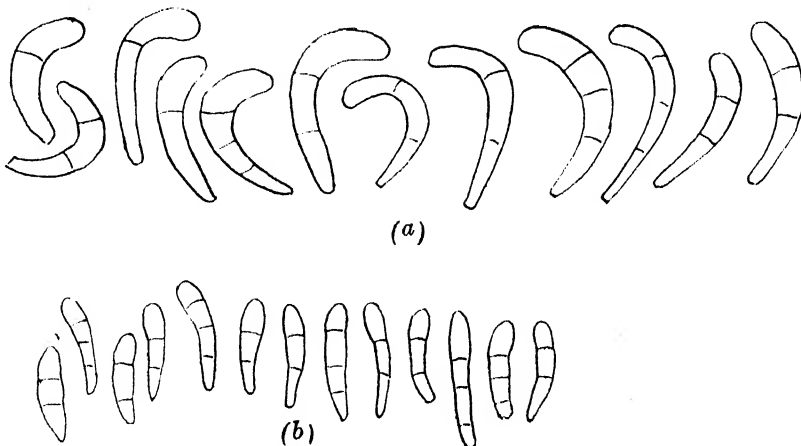


FIG. 8.—Conidia of (a) *Bulgariastrum bullatum*, and (b) *B. africanum*.

255. *Bulgariastrum bullatum* Doidge nov. spec.

Ascomata hypophylla et caulicola, in epiphylllo maculas rufo-brunneas usque 5 mm. latas leniter depressas efformantia, dense caespitosa et greges orbiculares 4-5 mm. latos vel confluyendo irregulares formantia, in stromata pulvinata erumpenti superficialia oriunda, subsessilia v. basi brevissime stipitiformi contracta, subturbinata, glabra, gelatinae, in sicco cornea, atra, disco leniter concavo dilute brunneo, 500-800 μ lato; contextu parenchymatico ex cellulis rotundatis 10-15 μ diam. composito. Asci clavati, apice rotundati, basi pedicellati, 65-100 μ longi, 12-14 μ lati, octospori. Paraphyses filiformes, sursum clavato incrassatae (2.5-4 μ) et epithecium densum flavo-fuscidulum formantes. Sporae oblique monostichae v. subdistichae, clavato-ellipsoideae, 1-septatae, leniter constrictae, hyalinae, 12.5-17.5 \times 5-7 μ (vix maturae) cellulae superiore plerumque late rotundata et crassiore.

Status conidiiferus *Oncospora bullata* Kalchbr. et Cooke.

Hab. in foliis *Capparis citrifoliae*, Langholm Estates, Bathurst, leg. Doidge, 12350.

Stromata amphigenous and caulicolous, but chiefly hypophyllous; usually crowded on leaf spots, which are up to 5 mm. diam., scattered, or numerous and becoming confluent; most conspicuous on the upper surface, where they are reddish-brown and concave. Conidiiferous stromata in close groups on leaf spots, round to ellipsoid, pulvinate, sometimes confluent and irregular, surface rough, dull black, often with irregular folds and cracks; a few stromata often form on the upper leaf surface, opposite the densely grouped stromata on the lower surface. (Plate II.)

Ascomata closely grouped on similar leaf spots, often interspersed with the conidiiferous stromata, or at least covering the centre of the spot with a border of the latter; under a low magnification, the disk is waxy in appearance with a raised, blackish-brown border.

The mycelium of the fungus in the epidermal cells of the host, sends out hyphae which penetrate more deeply into the leaf tissues: these hyphae are at first parallel, 4-6 μ thick, thin-walled, with cells 10-15 μ long; later becoming more closely septate and forming plates of angular cells 4-10 μ diam.; these are most conspicuous between the cells of the host near the lower leaf surface, but penetrate right through the leaf and produce similar plates of cells between the palisade cells on the upper side.

Under a stoma, the hyphae grow rapidly, forming a compact, stromatic mass of cells near the surface, which become thicker-walled, and are at first hyaline, then brown and sub-opaque; the epidermis is ruptured and the stroma continues to develop externally.

The conidiiferous stroma is pulvinate, 450-750 μ diam., 200-350 μ high, and the torn epidermis adheres closely to the sides of the stroma. The mature stroma consists of a blackish-brown, sub-opaque base, 150-250 μ diam., immersed in the outer cell layers of the leaf, expanding somewhat upwards and consisting of more or less parallel rows of cells 2-5 μ thick and 5-10 μ long, snuff-brown to pale fuscous in colour, pellucid, with a rough uneven cortical layer of darker irregular cells, loosely connected at the surface, globose, ellipsoid or polygonal in form and mostly 10-15 μ diam. The conidiiferous layer is formed within this cortex, which is 40-50 μ thick, and which ruptures and disappears as the conidia develop. Conidiophores forming a continuous layer, simple, straight, parallel, 10-15 μ long, 2-4 μ thick. Conidia dark olive-buff in mass, singly sub-hyaline, clavate, hamate to falcate, rarely almost straight, 20-35 μ long, 4-5 μ thick at the broadest point, which is about one-third of the distance from apex to base; not tapering or tapering slightly to the rounded apex, attenuated gradually to the truncate base, which is 2-2.5 μ thick.

Ascomata formed on a pulvinate stroma similar to that in which the conidia are produced; it usually develops from one-half of the stroma, the other half remaining sterile or producing a second ascoma or conidia. From a base 250-350 μ diam., the ascoma broadens rapidly, forming an expanded disk, 500-800 μ diam., slightly concave, rarely almost flat. Asci clavate, rounded at the apex, tapering gradually to the pedicellate base, 8-spored, sp. part 60-90 μ long, 12-14 μ broad, rather thin-walled, slightly thickened (2.5-4 μ) at the apex. Paraphyses filiform, clavate and ca. 4 μ thick at the apex, exceeding the asci and forming a dense, dark olive epithecium. Spores obliquely monostichous or

incompletely distichous, clavate-ellipsoid, 1-septate, very slightly constricted, 12.5–17.5 \times 5–7 μ , broadly rounded above, tapering gradually to the rounded base, upper cells rather shorter and broader than the lower. The spores examined were barely mature.

on *Capparis citrifolia* Lam., Langholm Estates, Bathurst, *Doidge*, 12350.

The conidial stage, *Oncospora bullata* Kalchbr. and Cooke [Grevillea IX (1880) p. 19] occurs very commonly near the south and south-east coast. The following collections have been examined:—

on *Capparis citrifolia* Lam., Kowie, *Stent*, 7789; Alexandria, *Doidge*, 22346; Knysna Heads, *Schonland*, 12512; Knysna, *Bottomley*, 32260, 32241; The Wilderness, *Doidge*, 17122; Bonza Bay, East London, *Bottomley*, 28680; Kingwilliamstown, *Weale* (ex Herb. MacOwan) 20806; Port Alfred, *Wager*, 28827; Grahamstown, *Hansford*, 33476; Kusaga Riv., *Archibald*, 33522; Bushmans River Mouth, *Archibald*, 33521.

Capparis Flanagani Gilg. and Bep., Boschberg, *MacOwan* 1273, 20982; Bushmans River, *Archibald*, 33523.

Capparis Gueinzii Sond., Uitenhage, *Pienaar*, 2362.

MacOwan 23, the type collection of *Oncospora bullata* is on *Capparis citrifolia*; his second collection, *MacOwan* 1273 was said to be on *Capparis Gueinzii*, but the portion of this collection in the Pretoria Herbarium appears to be on *C. Flanagani*, which was formerly included in *C. Gueinzii*.

The genus *Bulgariastrum* as at present known, comprises three species, all on leaves of *Capparis* spp. *B. bullatum* is closely related to *B. africanum* but appears to be quite distinct; the blue-green colour of the latter species is distinctive, and the conidial forms are more widely divergent than the ascomata. The type species, *B. caespitosum* Syd., occurs on *C. sepiaria* in the Philippines; the conidial form is *Oncospora caespitosa* v. Hohn. Ex description, the latter species approaches *B. bullatum*, but there are numerous minor differences, and no specimen of the Philippine fungus has been available for comparison.

CERCOSPORA SPECIES RECORDED FROM SOUTHERN AFRICA.

By Charles Chupp and Ethel M. Doidge.

Published records of the genus *Cercospora* in Southern Africa consist of a small number of descriptions of species on indigenous plants and scattered references, in lists of plant diseases, to species on plants in cultivation. Judging from specimens in the Cryptogamic Herbarium, Pretoria, the latter have not always been identified correctly. In the following pages 25 species on cultivated plants are listed; these are mostly cosmopolitan, or at least occur commonly in tropical and subtropical countries; several are recorded for the first time from Southern Africa.

No systematic collections have been made of fungi causing leaf spots on indigenous plants. Seven species of *Cercospora* were described by Kalkbrenner, Cooke and Winter from material collected by MacOwan and Medley-Wood; in later years, H. and P. Sydow described 10 species and *Cercospora Oliniae* was described by Verwoerd and Dippenaar. A considerable quantity of material in the Pretoria Herbarium had not been studied; unfortunately much of this is in poor condition and could not be identified, but an examination of leaves with lesions on which acervuli of *Cercospora* have developed has revealed a number of unrecorded species. It has been deemed advisable, therefore, to bring together all records of *Cercospora* spp. known to occur in Southern Africa.

In the following pages 75 species are listed; 25 occur on cultivated plants and the remainder on plants indigenous to South Africa; of the latter 18 were previously recorded from South Africa, 21 are species known in other parts of the world and 10 are described as new. The species are arranged in alphabetical order.

***Cercospora Apii* Fresen.**

Beiträge z. Mykol. 3 (1863), p. 91, Taf. XI, Figs. 46-54.

on *Apium graveolens* Linn. var. *dulce* D.C., Cedara, Natal, 2099.

***Cercospora arachidicola* Hori.**

Ann. Rept. Nishigara Agric. Exp. Sta., Tokyo (1917), p. 26.

on *Arachis hypogaea* Linn., Gwebi and Salisbury, *Eyles* 4987, 5001 (Rh. 481, 836, 2122); Bindura, *Hopkins* (Rh. 1619); Marandellas, *Hopkins* (Rh. 1474).

***Cercospora Argyrelobii* Chupp et Doidge nov. spec.**

Maculae amphigenae, per folium irregulariter dispersae, irregulares vel angulatae, sordide brunneae, minutae v. effusae, haud acute definitae. Caespituli amphigeni, plerumque epiphylli, minuti, laxè dispersi, atro-olivacei, in tomento denso folii absconditi. Hypostroma nullum v. minutum, sub epidermide innatum, irregulariter rotundatum, usque 40 μ diam., subhyalinum, contextu molliusculo indistincte parenchymatico. Conidiophora per stomata folii emergentia, haud vel plus minus fasciculata, pallide v. modice brunnea, ad apicem pallidiora, crassitudine irregularia, distincte creboque septata, saepe ad septa constricta, varie curvata v. tortuosa, raro geniculata, ramosa, 20-100 μ longa, 4-6.5 μ crassa, cicatrice conidii minuta ad apicem obtuse rotundatum v. conicum praedita. Conidia pallide v. modice olivaceo-brunnea, obclavata v. obclavato-cylindracea, breviora interdum cylindracea, recta v. leniter curvata, distincte 3-13-septata, interdum ad septa constricta, basi subtruncata vel ad basim obconice truncatam sensim attenuata, apice plerumque obtusa, 15-110 μ longa, 4-6.5 μ crassa.

Hab. in foliis *Argyrelobii* *Wilmsii* Harms, Nelspruit, leg. L. C. C. Liebenberg, 26075.

Cercospora Bauhiniae H. and P. Syd.

Ann. Myc. 12 (1914), p. 202.

Cercospora latimaculans Wakefield, Kew Bull. 1918, p. 210.

on *Bauhinia Galpini* N.E. Br., leaves, Tzaneen, *Liebenberg*, 32734; Nelspruit, *Liebenberg*, 26075; Schagen. *Liebenberg*, 32879.

Cercospora beticola Sacc.

Nuovo Giorn. Bot. Ital. 8 (1876), p. 189.

Cercospora flagelliformis Ell. et Halsted, N. Jersey Ann. Rept. for 1890 (1891), p. 355.

Cercospora Spinaciae Oud., Nederl. Kruidk. Arch. III, 2 (1900), 314.

Cercosporina spinacicola Sacc., Nuov. Giorn. Bot. Ital. N.S. 22 (1915), 73.

on *Beta vulgaris* L., leaves, Pretoria, 661, and *Naudé*, 27574; Pyramids, *Bottomley*, 30933; Potchefstroom, 23494; Schagen. *Liebenberg*, 26180; Kentani, *Pegler* 2389, 9429; Natal, without locality, 1078; Cedara, *Staples*, 15430; Maritzburg, *Erzleben*, 17006, 17008; Thornville Junction, *Slatter*, 23180; Bloemfontein, *Verwoerd*; Stellenbosch, *van der Byl* 1159; Stellenbosch, Kuilsrivier, Wynberg, Dieprivier, Paarl and Wellington, *Verwoerd*; Avondale (Rh. 711); Salisbury (Rh. 1742).

Beta vulgaris L. var. *Cicla* L., Pretoria, *Wager*, 23218 and *Naudé*, 27574.

Cercospora Byliana H. Syd.

Ann. Myc. 22 (1924) 433.

on *Allamanda cathartica* L., leaves, Tzaneen, *van der Byl* 1508, Co-type, 34277.

Cercospora caffra H. et P. Sydow.

Ann. Myc. 12 (1914), 267.

on *Sclerocarya caffra* Sond., leaves, Nelspruit, *Hall*, 6618, Co-type; Schagen, *Liebenberg*, 26353.

Cercospora canescens Ell. et Mart.

American Naturalist 16 (1882), 1001.

on *Dolichos biflorus* L., leaves, Salisbury (Rh. 2143).

Dolichos sp., Nelspruit, *Liebenberg*, 26070.

Phaseolus vulgaris L., Salisbury, *Eyles* 4999 (Rh. 1798, 1987).

Rhodesian records fide Hopkins in Proc. Rhod. Sc. Ass. 35 (1938), 122. The numbers in parentheses, with the letters Rh., are those of the Mycological Herbarium of the Department of Agriculture, Salisbury, Southern Rhodesia.

Cercospora Caryae Chupp et Doidge nov. spec.

Maculae amphigenae, per folium plus minus dense dispersae, irregulares, primitus minutae, 0.5-2 mm. diam., mox confluentes, plus minus effusae et saepe magnam folii partem occupantes, sordide brunneae, in epiphyllis tandem centro albicantes, saepe venulis folii imitatae. Caespituli epiphylli, minuti, densi, laxi v. densiuscule dispersi, vix perpicui, atro-olivacei. Hypostroma innato-erumpens, obscure v. olivaceo-brunneum, irregulariter rotundatum, 15-60 μ diam., laxi e cellulis rotundato-angulosis plerumque sat distinctis, 4-5 μ diam., metientibus compositum. Conidiophora dense caespitosa, simplicia,

haud geniculata, subrecta, 15-80 μ longa, 1-4-septata, saepe ad septa constricta, basi pallide brunnea, 4-6 μ lata, interdum usque 8 μ , apice obtuse rotundata pallidiora v. subhyalina. Conidia hyalina v. subhyalina, acicularia v. obclavata, recta v. lenissime curvata, pluriseptata, 20-75 μ longa, basi truncata v. subtruncata, 2.5-4 μ crassa, sursum ad apicem subacutum sensim attenuata.

Hab. in foliis *Caryae Pecan* Aschers, et Graebn., Alkmaar, 25441 Type; Plaston, leg. Wager, 28264.

Cercospora Cassinopsidis Wint.

Hedwigia 24 (1885), 34.

on *Cassinopsis capensis* Sond., Somerset West, *MacOwan*.

Type specimen not seen.

Cercospora circumscissa Sacc.

Fungi veneti novi vel critici, Ser. V. in Nuovo Giorn. Bot. Ital. VIII (1876), 189; Fung. Ital. autographice delineati, Fig. 659 (1881).

on *Prunus avium* L., leaves, Kingwilliamstown, *Dreyer*, 1187.

Cercospora Clerodendri Miyake.

Bot. Mag. Tokyo 27 (1913) 53, Tab. i, Figs. 20-21.

on *Clerodendron myricoids* R. Br. var. *cuneatum*, Nelspruit, *Liebenberg*, 26012.

The type of this species was not obtainable, so that the diagnosis is not absolutely certain; the fungus is distinct from *C. Bakeri* Syd. and from *C. Kashotoensis* Yam.

Cercospora Cluytiae Kalchbr. et Cooke.

Grevillea 9 (1880), 24.

on *Cluytia pulchella* L., leaves, Somerset East, *MacOwan* 1352, Kew, Type.

Cercospora coffeicola Berk. et Cooke.

Grevillea 9 (1881), 99.

Cercospora Coffeae Zimm., Ber. Land. u. Forstwirtschaft. in Deutsch-Ostafrika (1904) 35.

Cercospora Herrerana Farneti, Atti Ist. Bot. di Pavia 9 (1904), 13.

on *Coffea* sp., leaves, Nelspruit, *Liebenberg*, 26022; Concession (Rh. 907); Umtali (Rh. 912, 2735, 2946).

Cercospora columnaris Ell. et Everh.

Proc. Acad. Nat. Sci. Phil. (1894), Pt. III, p. 380.

Isariopsis griseola Sacc., Michelia 1 (1878), 273.

Cercospora Stuhlmanni P. Henn., Engl. Bot. Jahrb. 28 (1904), 40.

on *Phaseolus vulgaris* L., Pretoria, *Doidge*, 11387; Barberton, *Watts*, 15; Winkle Spruit, *Doidge*, 2504; Southern Rhodesia, *Hopkins*.

Cercospora Commelynae Kalchbr. et Cooke.

Grevillea 9 (1880) 24.

on *Commelina benghalensis* Linn., Somerset East, *MacOwan* 1346, Kew, Type.

Commelina sp., Stella Bush, Durban, *Marriott*, 32777.

Cercospora Corchori Sawada.

Agric. Exp. Sta., Formosa 1 (Special Bull. 19) (1919) 37, 667.

on *Corchorus tridens* Linn., Nelspruit, Liebenberg, 26001, 26309.

Cercospora Corchori has hyaline, acicular conidia. In the other species of *Cercospora* on this host genus conidia are coloured, not acicular.

Cercospora cruenta Sacc.

Michelia 2 (1880), 149.

on *Phaseolus vulgaris* Linn., Cedara, Staples, 15428; Potchefstroom, 23497; Southern Rhodesia, Hopkins.

Cercospora Curtisiae Chupp et Doidge nov. spec.

Maculae amphigenae, distinctissimae, irregulariter sparsae, suborbiculares v. irregulares, saepe angulatae, 2-4 mm. diam., obscure castaneo- v. purpureo-brunneae, saepe venulis folii limitatae, nonnunquam zonula rufo-brunnea circumdatae. Caespituli semper hypophylli. Conidiophora interdum dense fasciculata, in hypostromate rotundato obscure brunneo v. fere atro, 20-60 μ diam., indistincte parenchymatico orta, plerumque solitaria in hyphis ramosis procumbentibus oriunda, subhyalina v. pallide olivacea, continua, 15-70 μ longa, 2.5-4 μ crassa, raro septata v. geniculata, apice obtuse rotundata, haud attenuata, cicatricibus apicalibus conidiorum minutis. Conidia subhyalina v. pallide olivacea, obclavato-cylindracea, recta v. leniter curvata, obscure pluriseptata, basi obconice truncata, apice conica v. obtusa, 20-75 μ longa, 2.5-4 μ crassa.

Hab. in foliis *Curtisiae fagineae* Ait., Knysna, leg. Reinecke, 32077.

Cercospora delicatissima Kalchbr. et Cooke.

Grevillea 9 (1880), 24.

Asteroma pullum Kalchbr. in von Thümen, Flora 59 (1875), 380.

on *Priva Meyeri* Jaub. et Spach. (= *Priva dentata* Juss.) Boschberg, MacOwan 1109, 22013, Kew.

The spores of this species are hyaline, as shown by the type at Kew and the co-type at Berlin and Pretoria; it must therefore be transferred to the genus *Cercosporella* as ***Cercosporella delicatissima*** (Kalchbr. et Cooke) Chupp nov. comb.

Cercospora Demetritionana Wint.

Hedwigia 23 (1884) 170.

on *Crotalaria intermedia* Kl., Nelspruit, Liebenberg, 25970.

Crotalaria juncea Linn., Nelspruit, Liebenberg, 26676.

Cercospora Dissotidis Chupp et Doidge nov. spec.

Caespituli semper hypophylli, sine maculis sed decolorationes griseolas v. brunneolas indeterminatas interdum efficientes, plerumque dense aggregati et grages irregulariter angulatos, 2-10 mm. longos formantes, olivacei v. olivaceo-brunnei, inter pilos stellatos folii absconditi. Hypostroma nullum. Conidiophora plerumque haud fasciculata, solitaria, in hyphis ramosis, procumbentibus oriunda, 10-70 μ longa, crassitudine irregularia, 4-6 μ crassa, pallide olivacea v. fuliginea, parce septata, raro geniculata, apice obtuse rotundata, cicatrice unica conidii apicali parvula praedita. Conidia pallide v. pallidissime fuliginea, cylindracea, recta v. leniter curvata, 1-5-plerumque 3-septata, basi sensim obconice attenuata, apice obtusa, 20-55 μ longa, 4.5-6 μ crassa.

Hab. in foliis *Dissotidis incanae* Triana, Tweedie, Natal, leg. A. O. D. Mogg, 11651.

Cercospora Dovyalidis Chupp et Doidge nov. spec.

Maculae amphigenae, distinctissimae, irregulariter sparsae, primitus orbiculares v. ellipticae, dein interdum irregulares, 5–12 mm. diam., subacute definitae, distincte zonatae, zonulis irregulariter concentricis brunneo-olivaceis usque atro-brunneis, in hypophyllo haud raro linea elevata limitatis. Caespituli amphigeni, densi v. densissimi, in hypophyllo magis evoluti, per maculas irregulariter dispersi. Hypostroma in et sub epidermide innatum, breviter cylindraceum, 15–60 μ diam., erumpens, parenchymatice e cellulis angulatis, 2.5–5 μ crassis. 5–7.5 μ longis, pallide olivaceo-brunneis compositum. Conidia in cellulis superioribus hypostromatum leniter elongatis, 12–15 μ vel usque 30 μ longis, basi pallide olivaceo-brunneis ca. 4 μ crassis, sursum leniter attenuatis et pallidioribus, simplicibus, rectis, haud septatis, cicatricibus indistinctis oriunda. Conidia subhyalina v. pallide olivacea, filiformi-cylindracea, recta, curvata v. undulata, mox non, mox apicem conice acutum versus lenissime attenuata, pluriseptata, haud constricta, ad basim truncatam v. subtruncatam non v. sensim obconice attenuata, 35–95 μ longa, 2.5–4 μ crassa.

Hab. in foliis *Dovyalidis Zeyheri* Warb., prope Pretoria, leg. Doidge, 7398.

Cercospora egenula (H. Syd.) Chupp et Doidge nov. comb.

Cercoseptoria egenula H. Sydow, Ann. Myc. 33 (1935), 235.

on *Solanum panduraeforme* E. Mey., Nelspruit, Liebenberg, 25999, Co-type.

The genus *Cercoseptoria* is based on "dense fascicles of very short conidiophores" or almost sessile conidia. The length of the conidiophore is such a relative thing that fully half of the proposed species might be doubtful. Consequently all *Cercoseptoria* species with coloured conidiophores are considered by the senior author (C. Chupp) as being *Cercospora* spp.

Cercospora Faureae Chupp et Doidge nov. spec.

Maculae suborbiculares, 2–8 mm. diam., fusco-cinerascentes, linea purpurea usque brunnea cinctae, nonnunquam zonatae. Caespituli epiphylli, minuti, atri, perspicui, oculo nudo visibiles. Stromata prominentia, globulosa, atra, 50–200 μ diam. Conidiophora densissime fasciculata medie usque obscure olivaceo-brunnea, colore aequalia, crassitudine irregularia, parce septata, simplicia, haud geniculata, varie curvata v. flexa, apice obtuse rotundata, 10–45 μ longa 3.5–5 μ crassa. Conidia pallidissime olivacea, cylindracea, recta v. subrecta, 3–5-septata, basi obconice truncata, apice obtusa, 20–50 μ longa, 3–5 μ crassa.

Hab. in foliis *Faureae speciosae*, Concession, S. Rhodesia, leg. J. C. Hopkins (Rh. 1620).

The prominent stromata and very dense fascicles resemble somewhat *Cercospora Protearum* Cooke, but in Cooke's species the conidia are medium dark olivaceous and measure 30–65 \times 6–8 μ . The two fungi differ also in other characteristics.

Cercospora Fici Heald et Wolf.

Mycologia 3 (1911), 16.

? *Cercospora Fici-Caricae* Sawada, Dept. Agr. Res. Inst. Formosa 11 (1922), 151.

Cercospora ficicola v. Bond-Mont., Acta Inst. Bot. Acad. Sci. URSS. II, 3 (1936), 755.

on *Ficus Sycomorus* L., Nelspruit, Liebenberg, 26345.

This collection has shorter conidia than the type, but in other respects resembles it.

Cercospora fukushiana (Matsuura) Yam.

Journ. Plant Protection 14 (1927), 699.

Cercosporina fukushiana Matsuura, Trans. Tattori Soc. Agr. Sci. Japan 1 (–1928), 83.

on *Impatiens balsamina* Linn., Salisbury, S. Rhodesia, Hopkins (Rh. 4472), 34273.

Cercospora fusimaculans Atk.

Journ. Elisha Mitchell Sc. Soc. 8, Pt. 2 (1892), 18.

Cercospora Panici Davis, Trans. Wisc. Acad. Sci. 19 (1919), Pt. 2, p. 714.

? *Cercospora Panici-miliacei* Sawada, Descriptive catalogue Formosan Fungi V, Dept. Agr. Res. Inst., Formosa, Rept. 51 (1931), 131.

on *Brachiaria serrata* Stapf, Kaalfontein, *Pole Evans*, 10081.

Cercospora grandissima Rang.

Bol. Agric., São Paulo (1915), 322.

on *Dahlia pinnata* Cav., Salisbury, S. Rhodesia, *Hopkins*, (Rh. 507) 34259.

Cercospora guliana Sacc.

Ann. Myc. 11 (1913), 565.

Cercospora Amygdali Riza, Bull. Soc. Myc. Fr. 36 (1920) 191.

on *Prunus communis* Fritsch, Klerksdorp, 779; without locality, *Thomsen*, 1177;

Louws creek, *Bradbury*, 24891; *Kirkwood*, *Knights-Rayson*, 26634.

Cercospora Haemanthi Kalchbr.

Grevillea 9 (1880), 24.

on *Haemanthus magnificus* Herb., Pretoria, *Pole Evans*, 1203; Garstfontein, Pretoria district, *Doidge*, 1378; Buffelspoort, Marikana, *Doidge*, 28615.

Haemanthus natalensis Pappe, Maritzburg, *Doidge*, 867.

Haemanthus puniceus Linn., Boschberg, *MacOwan* 1020, Type (Herb. S. Afr. Mus. 35105); Natal, *Medley Wood*; Kentani, *Pegler* 2406, 2398, 9772, 9738.

Cercospora Halleriae Chupp et Doidge nov. spec.

Maculae per folium irregulariter dispersae, plerumque irregulares et plus minus angulatae, 2–5 mm. diam., venulis folii limitatae, in epiphyllis acute definitae, obscure rufo- v. purpureo-brunneae, in hypophyllo indistinctae, v. plus minus brunneolae. Caespituli hypophylli, minuti, vix perspicui. Conidiophora ca. 2–15 fasciculatim ad basim substromatice conjuncta, per stomata emergentia, pallide v. pallidissime olivaceo-brunnea plerumque simplicia, raro ramosa, parce septata, recta v. plus minus tortuosa, haud geniculata, apice conica, cicatrice conidii apicali minuta praedita, 10–35 μ longa, 2–4 μ crassa. Conidia obclavata, subhyalina, recta v. leniter curvata, obscure septata, basi rotundata v. obconice truncata, apice conice acuta, 15–70 μ longa, 1.5–3 μ crassa.

Hab. in foliis *Halleriae lucidae* Linn., Barberton, leg. P. A. van der Byl, 7377.

Cercospora heteromalla H. Syd.

Ann. Myc. 22 (1924), 433.

on *Rubus rosaefolius* Sm., Woodbush, *van der Byl* 1533, Co-type.

Cercospora insulana (Sacc.) Chupp nov. comb.

Cercosporina insulana Sacc. Nuovo Giorn. Bot. Ital. N.S. 22 (1915), 74.

Cercospora Staticis Lobik, Bolezni Rast. (Morbi Plantarum) 17 (1928), 195.

on *Limonium sinuatum* Mill., Pretoria, *Wager*, 21247.

Cercospora Jussieuae Atk.

Journ. Elisha Mitch. Sc. Soc. 8, Pt. 2 (1892) 18.

Cercospora Jussieuae-repentis Sawada, Descriptive Catalogue of the Formosan Fungi IV, Dept. Agr. Res. Inst. Formosa, Rept. 35 (1988), 108.

on *Jussieuia suffruticosa* L. var. *angustifolia* Lam., Nelspruit, *Liebenberg*, 26315.

Cercospora Kiggelariae H. Syd.

Ann. Myc. 22 (1924) 434.

on *Kiggelaria africana* Linn., Stellenbosch, *Brain* (van der Byl 1449) co-type; Stellenbosch, *Verwoerd* (van der Byl 2677); Schagen, *Liebenberg*, 26315.

Cercospora Leoni Savul et Rayss.

Revue Path. Veg. and Entom. Agric. 22 (1935) 222.

on *Vitis vinifera* Linn. (sultana) Upington, *Hugo*, 33155; Marchand, Kakamas, *Valentin*, 33898; Upington, *du Plessis* (Stell. 1045, 1046).

Mr. E. W. Mason of the Imperial Mycological Institute examined No. 33155 and wrote: "I think that No. 33155 can be included in this species (*Cercospora Leoni*). The diagnosis gives the spores as 0-, then 1-2-, rarely 3-septate, $18-40 \times 6.5-7 \mu$. The South African material is usually 1-septate, rarely 2-septate, $14-25 \times 5.5-8 \mu$. *Cercospora* now includes species with free conidiophores, sporodochia, synnemata like this specimen, and acervuli. I think it is best to conform to this current opinion."

Five species of *Cercospora* have been described on *Vitis vinifera* which are identical or nearly related:—

Cercospora vitiphylla (Speschnew) Barbarine (reference not found).

Cercospora Roesleri (Cattan.) Saccardo, *Michelia* 2 (1880), 128.

Cercospora Leoni Savul et Rayss, l.c.

Cercospora coryneoides Savul et Rayss, l.c.

Cercospora Fuckelii Jacz (citation not known).

All of these resemble closely the fungus named *Septosporium heterosporum* by Ellis and Galloway. They also resemble species of *Coryneum*; Speschnew (Fungi Transcapici et Turkestani) named his fungus *Coryneum vitiphyllum*. If this fungus on *Vitis vinifera* is to be regarded as a *Cercospora*, it could well be *Cercospora Leoni*, but the senior author (Ch. Chupp) is inclined to consider some other genus than *Cercospora* and would be willing to leave it under the name proposed by Ellis and Galloway.

Cercospora Leonotidis Cooke.

Grevillea 8 (1879), 72.

on *Leonotis leonitis* R. Br., Inanda, *Medley Wood* 5.

The portion of the collection *Medley Wood* 5 in the Pretoria Herbarium, No. 10175, is *Puccinia Leucadis* on *Leucas martinicensis*; it would appear that a mixed collection has been distributed under this number.

Cercospora Liebenbergii H. Syd.

Ann. Myc. 33 (1935) 235.

on *Rauwolfia caffra* Sond., Schagen, *Liebenberg*, 26177 Co-type, 30964.

Cercospora malayensis Stev. et Solh.

Mycologia 23 (1931), 394.

on *Hibiscus cannabinus* Linn., Schagen, *Liebenberg*, 26312; Nelspruit, *Liebenberg*, 26674; Salisbury, S. Rhodesia, *Hopkins* (Rh. 1233); Sinoia, *Hopkins* (Rh. 548); Shamva, *Hopkins* (Rh. 1252).

No. 26312 resembles the type more closely than does 26674, which has shorter, slightly narrower conidiophores and conidia than the type, but it may be a less mature specimen.

Cercospora melaena H. Syd.

Ann. Myc. 22 (1924), 434.

on *Flemingia Grahamiana* W. and A., Woodbush, *van der Byl* 1522, Co-type, and *Doidge*, 32911.

Cercospora melanochaeta Ell. et Everh.

Proc. Acad. Nat. Sci. Phil. (1894), 380.

on *Gymnosporia burifolia* Szysz., Verulam, *van der Byl*, 6946; Kentani, *Pegier* 2405, 9771; Schagen, *Liebenberg*, 26350; Escombe, *Hean*, 33214.

Cercospora Momordicae McRae.

Ann. Crypt. Exot. 2 (1929), 267.

Cercospora Chardoniana Chupp, Monographs Univ. Porto Rico 2 (1934), 245.

Cercospora Momordicae Mendoza, Philippine Journ. Sci. 75 (1941), 173.

on *Momordica foetida* Schum. and Thom., Kentani, *Pegler* 2453, 11679.

Cercospora Musae Zimmermann.

Centralbl. f. Bakt. II, 8 (1902), 219.

Cercospora Musae Masee, Kew Bull. (1914), 159.

on *Musa* sp., Gondola, Moçambique (Rh. 5766), 34275.

Cercospora myrticola Speg.

Ann. Soc. Cientif. Argent. 17 (1884), 167.

Cercospora Myrti Eriks., Bidr. till. Käned. Odl. Växt. Szukdomar. Stockholm (1885), 79. [See also Trans. Brit. Myc. Soc. 6 (1919), 157.]

on *Myrtus communis* Linn., Blauwvlei, Wellington, *Doidge*, 2066; Hopefield *van der Byl* 1327.

Cercospora Nicotianae Ell. et Everh.

Proc. Acad. Nat. Sci. Phil. (1893), 170.

on *Nicotiana Tabacum* Linn., Swaziland, *Gray*, 894; Zomba, Nyasaland, det. Mason; Salisbury, Southern Rhodesia, *Hopkins* (Rh. 532, 1801, 1803, 3786); Eldorado, *Hopkins* (Rh. 1767); Trelawney, *Hopkins* (Rh. 3304).

Cercospora oblecta H. Syd.

Ann. Myc. 33 (1935), 235.

on *Annona senegalensis* Pers., Nelspruit, *Liebenberg*, 26403, Co-type.

Cercospora occidentalis Cooke.

Hedwigia 17 (1878), 39.

Cercospora personata (B. and C.) Ellis var. *occidentalis* Berk. et Cooke, Grevillea 3 (1874), 106.

Cercospora Paulensis P. Henn., Hedwigia 48 (1908), 18.

Cercospora somalensis Curszi, Bol. R. Staz. Patol. Veget. n.s. 12 (1932), 158.

Cercosporina occidentalis (Cooke) Sacc. Syll. Fung. 25 (1931), 1906.

Cladosporium personatum Berk. et Curt. var. *Cassiae* Thüm., Myc. Univ. No. 1964.

Ramularia cassiaeicola Heald et Wolf, U.S. Dept. Agric. Bur. Plant Ind., Bull. 226 (1912), 101.

on *Cassia delagoënsis* Harv., Nelspruit, *Liebenberg*, 26033; Schagen, *Liebenberg*, 26352, 32881.

Cercospora Oliniae Verw. et Dipp.

South Afric. Journ. Sci. 27 (1930), 326.

on *Olinia cymosa* Thunb., Stellenbosch, *Dippenaar* (van der Byl 2583), Co-type.

Cercospora omphacodes Ell. et Holw.

Journ. Myc. 1 (1885), 5.

Cercospora Phlogina Peck, New York State Mus. Bull. 150 (1911), 24.

on *Phlox Drummondii* Hk., Cramond, *Hill*, 6836.

Cercospora Pachycarpi Chupp et Doidge nov. spec.

Maculae amphigenae satis perspicuae, sordide brunneae, angulatae, primitus oblongae, 6–12 × 2·5–3 mm., venulis folii limitatae, deinde plus minus confluentes, irregulares et saepe magnam folii partem occupantes. Caespituli amphigeni, plerumque epiphylli, laxè dispersi, obscure olivacei, minuti. Hypostroma minutum vel usque 60 μ diam., in parte basali subepidermali e cellulis laxè parenchymaticis rotundato-angulatis, 5–7·5 μ diam., compositum; cellulae in superiore parte cylindricae per stoma emergentes, valde elongatae, pallidiores, ca. 2·5 μ crassae, in conidiophora transeuntes. Conidiophora plus minus dense fasciculata, crassitudine irregularia, interdum clavata, pellucide olivaceo-brunnea, ad apicem haud pallidiora, recta v. tortuosa, parce sed distincte septata, raro geniculata, 10–35 μ longa, 5–7·5 μ crassa, cicatricibus conidiorum apicalibus v. subapicalibus, unicis v. pluribus in quoque conidiophoro praedita. Conidia pallide olivacea, obclavata, recta v. leniter curvata, obscure pluriseptata, basi obconice truncata, apice subobtusata, 40–130 μ longa, 4·5–6 μ crassa.

Hab. in foliis *Pachycarpi Schinziani* N.E. Br., Wonderboom prope Pretoria, leg. F. A. van der Byl, 2208.

Cercospora Pareirae Speg.

Ann. Mus. Nac. Buenos Aires 20 (1910), 440.

on *Cissampelos mucronata* A. Rich., Schagen, *Liebenberg*, 26314.

Cercospora Persicariae Yam.

Journ. Trop. Agric. Formosa 6 (1934), 605.

?on *Polygonum tomentosum* Willd., Nels Rivier nr. Nelspruit, *Liebenberg*, 26011.

This may be an undescribed species, but as the material is in poor condition and few spores present, it is impossible to be certain.

Cercospora personata (Berk. et Curt.) Ellis.

Journ. Myc. 1 (1885), 63.

on *Arachis hypogaea* Linn., Skinner's Court, 993, 1287; Hartebeestpoort Expt. Sta., *Sellschop*, 32136, 32137; Crecy, *Sellschop*, 30649; Nelspruit, *Liebenberg*, 26675; Immerpan, *Steen*, 25364; Barberton, *Parsons*, 25363; Northern Flats, *Dros*, 25924; Cedara, *Staples*, 17060; Maritzburg, *Erzleben*, 15447; Sao Paulo, Moçambique, *Howard*, 978.

Cercospora phaeocarpa Mitter.

Ann. Myc. 35 (1937), 239.

on *Bauhinia Thonningii* Schum., Concession, *Hopkins* (Rh. 1621), 34265.

This collection exactly resembles the type, which is on leaves of *Bauhinia* sp., Majhgawan, India. It has been agreed by the senior author (Ch. Chupp) and by Mr. E. W. Mason of the Imperial Mycological Institute, Kew, that all species with thick-walled conidia, especially if they are dark-coloured and closely septate, should be classed as *Helminthosporium*. *Cercospora phaeocarpa* should therefore be transferred to the genus *Helminthosporium*; it is quite distinct from *C. Bauhiniae*.

Cercospora Pouzolziae H. Syd.

Ann. Myc. 33 (1935), 236.

on *Pouzolzia hypoleuca* Wedd., Nelspruit, *Liebenberg*, 26013, Co-type.

Cercospora pretoriensis Chupp et Doidge nov. spec.

Maculae amphigenae, irregulariter sparsae, suborbiculares, 2-6 mm. diam. saepe 2 vel 3 juxtapositae et plus minus confluentes, in epiphyllis distinctissimae centro pallide brunneae v. sordide griseae, zonula plus minus lata rubra v. rufo-brunnea circumdatae, in hypophyllo minus perspicuae zonula pallidiore. Caespituli epiphylli, per maculam dense v. irregulariter dispersi, punctiformes, non vel vix confluentes, atro-olivacei, singuli subinde tantum hypophylli. Hypostroma innatum, olivaceo-brunneum, irregulariter rotundatum, 15-60 μ diam., plus minus erumpens, contactu molliusculo, indistincte parenchymatico, e cellulis angulato-rotundatis ca. 4-5 μ diam. metientibus compositum. Conidiophora dense caespitosa, in fasciculis olivaceo-brunnea, singula pallide fuliginea, simplicia, septata, cylindracea, apicem obtuse rotundatum versus attenuata et pallidiora, plus minus curvata v. tortuosa, raro abrupte geniculata, 10-100 μ longa, 3-5 μ crassa. Conidia hyalina, anguste cylindracea v. subacicularia, recta v. leniter curvata, interdum subfalcata, pluriseptata, 30-90 μ longa, basi subtruncata, 2-4 μ lata, sursum haud vel sensim attenuata, apice subobtusata.

Hab. in foliis *Gomphrenae decumbentis* Jacq. var. *genuinae* Stuchlik, Arcadia, Fretoria, 6593 Type et 775; Skinner's Court, Pretoria, 1937; Donkerpoort, Pretoria district, leg. Doidge et Bottomley, 32789; Schagen, leg. Liebenberg, 26316.

Cercospora Protearum Cooke.

Grevillea 12 (1883), 39.

Cercospora Protearum var. *Leucospermi* Cooke, l.c.

Cercospora Protearum var. *Leucadendri* Cooke, l.c.

on *Leucospermum conocarpum* R. Br., Hottentot's Holland, *MacOwan* 1456 (Ranenh, Fung. Eur. 3589) 3929, Kew; St. James, *Pole Evans*, 5570; Stellenbosch. *Duthie* (van der Byl 62).

Leucadendron argenteum R. Br., Table Mt., Cape, *MacOwan* 1457, Kew; Kirstenbosch, *Pearson*, 8354.

Cercospora psychotriacola Chupp et Doidge nov. spec.

Maculae utrinque perspicuae, sparsae, plerumque foliorum marginibus occupantes, suborbiculares v. irregulares, saepe venulis folii limitatae et tunc angulosae, 3–8 mm. diam., castaneo-brunneae, interdum zonula plus minus lata pallide viridula circumdatae. Caespituli hypophylli, grisei v. olivacei, per totam maculam densiuscule dispersi. Hypostroma infra stomata subepidermide innatum, irregulariter rotundatum, 55–85 μ diam., erumpens, in parte basali parenchymatice e cellulis opace brunneis indistinctis composita, cellulae in superiore parte olivaceae, elongatae, 2.5–4 μ crassae, in conidiophora transeuntes. Conidiophora dense stipata, divergentia, dilute olivacea, apicem versus pallidiora, crassitudine aliquanto irregularia, parce septata, haud geniculata, simplicia, recta v. curvata, apice obtuse rotundata, 5–45 μ longa, 2–4 μ crassa. Conidia subhyalina v. dilute olivacea, anguste obclavata, apicem versus leniter attenuata, obscure pluriseptata, recta v. curvata, basi obconice-truncata, apice subacuta, 40–120 μ longa, 2–4 μ crassa.

Hab. in foliis *Psychotriae capensis* Vatke, in sylvis Mambatini prope Nelspruit, leg. A. O. D. Mogg, 32773.

Cercospora punctiformis Sacc. et Roum.

Rev. Myc. 3 (1881), 39.

Cercospora Vincetorici Ell et Everh., Journ. Myc. 8 (1902), 73.

on *Cynanchum natalitium* Schlecht., Isipingo, Doidge, 6642.

This specimen resembles the original in every particular, except that the conidia are longer, 30–100 \times 3–4 μ , as compared with 20–55 \times 3–4 μ .

Cercospora Resedae Fuck.

Symb. Myc. (1869), 353.

on *Reseda odorata* Linn., Kentani, Pegler 2390, 9428, Kew; Barberton, 439; Hopefield, van der Byl 1272.

Cercospora Rhoicissi H. et P. Sydow.

Ann. Myc. 10 (1912), 444.

on *Rhoicissus erythroides* (Fres.) Planch., Barberton, Lounsbury, 1275, Co-type.

Cercospora riachueli Speg.

An. Soc. Cientif. Argent. 9 (1880), 38.

on *Cissus* sp., Schagen, Liebenberg, 26178.

This is like the type, except that the conidia are longer and do not average as wide. It is not like *Cercospora Cissi-japonicae* Hori, which has wider conidia and much longer conidiophores.

Cercospora richardiaecola Atk.

Journ. Elisha Mitchell Sc. Soc. 8, Pt. 2 (1892), 19.

on *Zantedeschia aethiopica* (L.) Spreng., Pretoria, Bottomley, 14269; Salisbury, S. Rhodesia (Rh. 1214).

Zantedeschia angustiloba (Schott.) Engl., Pretoria, Bottomley, 14271.

Zantedeschia Rehmanni Engl., Pretoria, Bottomley, 14270.

Zantedeschia sp., Maritzburg, Schmutz, 31198.

Ceroospora ricinella Sacc. et Berk.

Atti R. Ist. Veneto Sci., Lett. ed Arti, 6 ser., III (1885), 711.
on *Ricinus communis* Linn., Nelspruit, *Liebenberg*, 26010.

Ceroospora rubro-tincta Ell. et Everh.

Journ. Myc. 3 (1887), 20.
Ceroospora consobrina Ell. et Everh., Journ. Myc. 3 (1887), 19.
on *Prunus persica* Sieb. et Zucc., Potchefstroom, 23496.

Ceroospora scitula H. Syd.

Ann. Myc. 33 (1935), 236.
on *Annona senegalensis* Pers., Nelspruit, *Liebenberg*, 26027.

Ceroospora Sesami Zimm.

Ber. Land.—u. Forstwirtschaft. Deutsch-Ostafrik. (1904), 28.
on *Ceratotheca triloba* E. Mey., Schagen, *Liebenberg*, 26179.
Pretrea zanguebarica J. Gay, Nelspruit, *Liebenberg*, 26048.

This fungus closely resembles the type, but cross inoculations should be made from *Sesamum* to *Ceratotheca* and *Pretrea*.

Ceroospora Solani-melongenae Chupp.

Ceroospora Solani-melongenae Hori nom. nud.

Maculae amphigenae, per folium irregulariter dispersae, subinde 2 vel 3 juxtapositae et plus minus confluentes, suborbiculares, rufo-brunneae, nonnunquam zonula indistincta obscuriori marginatae, centro demum arescentes. Caespituli amphigeni, laxae v. densiuscule dispersi, olivacei, minuti. Hypostroma in et sub epidermide innato-erumpens, irregulariter globosum, obscure brunneum, parenchymatice e cellulis roteundato-angulosis, ca. 3–5 μ diam. compositum. Conidiophora densissime, caespitosa, in fasciculo olivaceo-brunnea, singularia dilute olivacea, apicem versus pallidiora, crassitudine aequalia v. irregularia, continua v. parce septata, semper simplicia, haud geniculata, recta v. leniter curvata, apice obtusa v. conoidea, saepe brevissima, 5–30 μ longa, 3–5 μ crassa. Conidia subhyalina v. dilute olivacea, obclavato-cylindracea, recta v. lenissime curvata, 3–7-septata, basi subtruncata v. obconica, apice conica v. obtusa, 30–40 μ longa, 3–5 μ crassa.

Hab. in foliis *Solani melongenae*, Japan, leg. Hori.

Ceroospora Solani-melongenae Hori is a nomen nudum, which was withdrawn by Hori in favour of *C. Melongenae* Welles. The particulars are given by Areta Ideta in the "Supplement to Handbook of the Plant Diseases of Japan II (1926), pp. 996–7." Welles' species has hyaline acicular conidia and in no way resembles Hori's collection, which was distributed to various herbaria. The above description is based on the portion of Hori's collection to be found at Washington, D.C. Hori's species is identical with the fungus collected on the Natal coast, which may now be named:—

Ceroospora Solani-melongenae Chupp.

on *Solanum Melongena* L. var. *esculentum* Nees, Cavendish, Natal, *Wager*, 34107

Ceroospora Sorghi Ell. et Everh.

Journ. Myc. 3 (1887), 15.
on *Cymbopogon atronardus* Stapf, Nelspruit, *Liebenberg*, 26061.

Cymbopogon excavatus Stapf, Wolwekloof, *Bottomley*, 29953; Schagen, *Liebenberg*, 32910.

The South African fungus resembles the type fairly closely, but the conidiophores and conidia are slightly smaller than in many collections.

***Cercospora sphaeroidea* Speg.**

Anal. Soc. Cientif. Argentina 16 (1883), 169.

on *Cassia delagoensis* Harv., Umbelusi, Moçambique, *Howard*, 522.

***Cercospora Stizolobii* H. et P. Sydow.**

Ann. Myc. 11 (1913), 270.

Cercospora Mucunae-ferrugineae Yamamoto, Trans. Sapporo Nat. Hist. Soc. 13 (1934), 141.

on *Stizolobium Deeringianum* Bort., Salisbury, Hopkins (Rh. 5302), 33969.

***Cercospora transvaalensis* H. Syd.**

Ann. Myc. 33 (1935), 237.

on *Acalypha petiolaris* Hochst., Nelspruit, *Liebenberg*, 26002, Co-type.

***Cercospora Tremae* (Stev. et Solh.) Chupp nov. comb.**

Ragnhildiana Tremae Stev. et Solh., Mycologia 23 (1931), 405.

on *Trema guineensis* (Schum.) Ficalho, Durban, *Doidge*, 1671.

***Cercospora Violae* Sacc.**

Nuovo Giorn. Bot. Ital. 8 (1876), 187.

on *Viola odorata* Linn., Pretoria, *Faure*, 884, *Pole Evans*, 6678 and *Wager* 21580; Potchefstroom, 23495; Barberton, 440; Fort Hare, *Lyle*, 25422, Idutywa, *Inray*, 22343; Cramond, *Pole Evans*, 1497; Donnybrook, *Morgan*, 28610; Salisbury, *Eyles* 2098, 14015; Lourenço Marques, *Howard*, 951; Salisbury, *Hopkins* (Rh. 1314, 1602), Kew.

Viola tricolor Linn., Claremont, Cape, 741.

***Cercospora Vitis* (Lév.) Sacc.**

Fung. Ital. aut. del., tab. 671 (1881).

Cercospora viticola (Ces.) Sacc., Syll. Fung. 4 (1886), 458, and many other synonyms.

on *Vitis vinifera* Linn., Pretoria, *Bottomley*, 32636; Vaalwater, Waterberg, *Farrant*, 30765; Buffelspoort, *Bottomley*, 32701, Middelburg, Tvl., 612; Kingwilliamstown, *Mally*, 462, 1182, 1173; Verulam, *James*, 33299; Eshowe, *Pole Evans*, 2025; Ezulweni, Swaziland, *Douglas*, 26378; Modder River, *Dreyer*, 283; Kentani, *Pepler*, 9740; Gwelo (Rh. 2048); Salisbury (Rh. 1535, 1988, 1820).

***Cercospora Withaniae* Syd.**

Ann. Myc. 10 (1912), 444.

on *Withania somnifera* Dun., Bluff, Durban, *Doidge*, 1672, Co-type.

***Cercospora Zizyphi* Petch.**

Ann. Roy. Bot. Gard. Peradinya 4, Pt. 5 (1909), 306.

on *Zizyphus mucronata* Willd., Barclayvale, *Liebenberg*, 32880; Schagen, *Liebenberg*, 26347, 32876; Tzaneen, *Liebenberg*, 32726.

SOUTH AFRICAN RUST FUNGI.

By E. M. Doidge.

Part V.

Aecidium Barleriae Doidge nov. spec.

Aecidia hypophylla, in epiphylllo decolorationes sat conspicuas indeterminatas brunneas efficientes, in greges plus minus orbiculares usque 3 mm. diam. metientes disposita, cupulata, 200–250 μ diam.; peridio diutius vesiculoso-clauso, tandem late aperto et cupulato, margine albido, erecto vel parum recurvato, integro v. irregulariter inciso; cellulis peridii firme conjunctis rhomboideis v. oblongis, 30–42 \times 17.5–22.5 μ , pariete exteriori striato, 6–8 μ crasso, interiore dense verrucoso, 3–4 μ crasso. Aecidiosporae angulato-globosae vel oblongae, 22.5–30 \times 17.5–20 μ , dense sed subtilissime verruculosae, membrana hyalina 1–1.5 μ crassa.

Hab. in foliis *Barleriae crassae* C.B.C1, Concession, Rhodesia, leg. Hopkins (Rh. 3684), 33423.

The aecidia are on poorly defined leaf spots, which are at first purplish-brown on the upper side of the leaf; later they become light brown and dry in the centre immediately opposite the aecidia, but still retain a purplish-brown margin.

Aecidium benguellense Lager.

in Bol. da Soc. Brot. VII (1889) p. 134; Syd. Monogr. Ured. IV (1925) p. 89.

Spermogonia amphigenous, fairly numerous, in rather close groups, 80–120 μ diam., at first honey-yellow, then brown and finally black.

Aecidia hypophyllous, on reddish-brown leaf spots, in round groups 1–2 cm. diam., arranged in circles, cupulate, 200–300 μ diam. Margin of the peridium white, revolute, lacinate; cells of the peridium firmly united, imbricate, rhomboid or irregularly angular, 35–40 μ long, 20–25 μ broad, outer wall striate, 6–8 μ thick, inner verrucose, 4–6 μ thick. Spores angular globose, ellipsoid or oblong, closely and minutely verrucose, subhyaline, 23–28 \times 17–23 μ ; epispore 1 μ thick, always thicker at the apex (3–8 μ).

on leaves of *Temnocalyx obovatus* Robyns, Concession, Hopkins (Rh. 3682), 33424.

Aecidium benguellense was originally described on leaves of *Stephanostigma fuchsoides* Welw., from Lake Iwantála, Huilla, where it was collected by Welwitsch. This plant is now known as *Temnocalyx fuchsoides* (Welw.) Robyns.

Aecidium Diospyri A. L. Sm.

in London Journ. of Bot. XXXVI (1898) p. 178; Syd. Monogr. Ured. IV (1924) p. 144.

Aecidium atro-album P. Hennings in Bot. Ergebnisse der Kunene-Sambesi Exped. (1903) p. 162.

Spermogonia epiphyllous, closely crowded, shiny black, 180–220 μ diam.

Aecidia on yellow or yellow-brown leaf spots, which become blackish-brown and finally pale or whitish-brown in the centre with a blackish border. *Aecidia hypophyllous* in round groups 1–3 mm. diam., closely crowded, briefly cylindrical, ca. 200 μ diam.; the ruptured and blackened epidermis is persistent and surrounds the aecidium like a wall. Margin of the peridium white, revolute, denticulate; cells of the peridium firmly joined together; imbricate, pentagonal to hexagonal, 24–30 \times 17–20 μ , the upper part densely verrucose,

outer wall 4–5 μ thick, inner 3–4 μ thick. Spores globose, subglobose, angular or ellipsoid, closely and minutely verruculose, subhyaline, 17–22 \times 16–18 μ ; epispore ca. 1 μ thick.

on leaves of *Diospyros mespiliformis* Hochst., Hippo Pool, Kruger National Park, Liebenberg, 32729.

The type was collected by Welwitsch in Angola on the same host; the same fungus, collected by Baum on the Kunene River, was described by Hennings (l.c.) under the name *Aecidium atro-album*.

***Aecidium Dipcadi-viridis* Doidge nov. spec.**

Aecidia hypophylla in greges ellipticos v. subrotundatos 6–15 mm. longos dense congesta, circinatim disposita, profunde immersa, 150–220 μ diam; peridio diutius vesiculo-clauso, tandem cylindraceo, usque 500 μ longo, margine albo, leniter recurvato, inciso; cellulis peridii firme conjunctis, irregulariter polygonalibus, saepius quadriticis, imbricatis, 22·5–40 \times 20–25 μ , pariete exteriore striato 7·5–10 μ crasso, interiore verrucoso, 4–5 μ crasso. Aecidiosporae angulato-globosae, ovatae v. oblongae, hyalinae v. subhyalinae, minute verruculosae, 21–26 \times 17·5–20 μ , membrana ca. 1·5 μ crassa.

Hab. in foliis *Dipcadi viridis* Moench., Mamathes, Basutoland, leg. Hean, 33136.

This aecidium often causes some hypertrophy of the host tissues; it differs from *Aecidium Dipcadi* Har. and Fat., described on *Dipcadi ndellansis* from Central Africa.

***Aecidium heliotropicolum* Talbot nov. spec.**

Aecidia foliicola, caulicola et calycicola, in foliis amphigena, cylindracea circa 1 mm. longa, 300–500 μ diam., albida v. pallide mellea, margine revoluta lacerato, in greges grandes inaequaliter disposita; cellulis peridii firme conjunctis, imbricatis, aut subglobosis aut quadraticis vel polygonis, 14–20 \times 17–26 μ , pariete exteriore striato, ca. 4 μ crasso, interiore verrucoso et striato 1·5–2·8 μ . Aecidiosporae subhyalinae vel melleae, oblongae polygonales v. angulato-subglobosae, 11–15 \times 17–23 μ ; episporio dense minuteque verrucoloso, 1–1·5 μ crasso.

Hab. in foliis, caulibus et calycibus *Heliotropii Nelsoni*, in regione Potchefstroom, leg. W. J. Louw, 35016.

Aecidia on leaves, stems and calyces, amphigenous. on leaves, cylindrical, up to 1 mm. long and 300–500 μ diameter, densely aggregated in large irregular groups commencing as discrete, subepidermal, yellowish-green spots, more or less obscured by the epidermal hairs. Peridium white to very pale yellow, when young closed at the apex, later opening with a lacerate, somewhat revolute margin, easily breaking off and leaving a shallow basin partly embedded in the host tissue. Peridial cells compact, firmly joined together, imbricate, occasionally subglobose, usually irregularly quadratic or polygonal, 14–20 \times 17–26 μ ; outer wall striated, about 4 μ thick; inner wall striated, verrucose, 1·5–2·8 μ thick. Aecidiospores subhyaline, 11–15 \times 17–23 μ ; epispore very finely verrucose, 1–1·5 μ thick.

on *Heliotropium Nelsoni* Wright, Potchefstroom District, 18.12.44, W. J. Louw, 35016.

***Aecidium incertum* Syd.**

in Hedwigia XL (1901) p. (1).

The type specimen of this rust (Thuem. Myc. Univ. No. 1118) collected by MacOwan, is said to be on *Senecio napifolius* Schrad. (= *S. erucifolius* Linn.) which occurs in Europe and northern Asia. The material available for examination is sparse, but the host of the type collection is not *S. napifolius* nor does it appear to be an introduced weed. It is probably an indigenous species near *S. hastulatus* Linn.

***Aecidium kakelense* P. Henn.**

in Bot. Ergebnisse der Kunene-Sambesi Exped. (1903) p. 161 ; Syd. Monogr. Ured. IV (1924) p. 189.

Spermogonia sometimes present, not numerous, hypophyllous, interspersed with the aecidia, honey-yellow, 100–125 μ diam.

Aecidia hypophyllous, infected leaves showing a reddish discolouration on the upper surface and remaining expanded when normal leaves are revolute. Aecidia distributed closely and evenly over the whole leaf surface, cylindrical, 400–700 μ long, 250–350 μ diam. Margin of the peridium white, slightly re-curved, and becoming lacerate; cells of the peridium firmly connected, sub-rhomboid, 22–30 \times 18–24 μ ; outer wall conspicuously striate, 6–8 μ thick, inner closely verrucose, ca. 3 μ thick. Spores angular globose, ovate or ellipsoid, densely and minutely verrucose, 18–24 \times 16–20 μ ; epispore 1.5 μ thick.

on *Euphorbia natalensis* Bernh., on leaves, Lidgetton, Mogg, 17034.

Euphorbia striata Thunb., Mooi River, Mogg, 11797.

Euphorbia sp., near *Eu. cyparissioides* Pax, Rusapi (Rh. 4292) 33426 ; Marandellas, Hopkins (Rh. 4822) 33428.

Aecidium kakelense was originally described by Hennings on a *Euphorbia* species "cum foliis minutis ca. 1 cm. longis", collected by Baum near Kakele in South West Africa. The hosts listed above belong to the same group of *Euphorbia* spp.

***Aecidium Nestlerae* Doidge nov. spec.**

Aecidia ramicola et foliicola, per ramulis leniter incrassatis irregulariter laxeque distributa, in foliis vix incrassatis amphigena, aurantiaca, 250–350 μ diam; peridio diutius vesiculoso-clauso, tandem cylindraceo, usque 750 μ longo, aperto, margine erecto vix lacerato; cellulis peridii firme conjunctis, imbricatis, rhomboideis v. irregularibus, 20–30 \times 12.5–20 μ , pariete exteriore striato, 10–12.5 μ crasso, interiore verrucoso, 3–4 μ crasso, Aecidio-sporae aurantiacae, angulato-globosae, 17.5–25 \times 15–20 μ , subleves, membrana hyalina ubique 1.25–1.5 μ crassa.

Hab. in ramulis folisque *Nestlerae confertae* DC., Kafferfontein, Fauresmith, leg. P. Kies, 34096.

***Aecidium Pentziae-globosae* Doidge nov. spec.**

Aecidia ramicola, pallide ochracea, per ramos juniores irregulariter et densiuscule distributa, matricem deformantia, 200–250 μ diam.; peridio diutius vesiculo-clauso, tandem cylindraceo usque 1 mm. longo, margine albo leniter recurvato, plus minus inciso; cellulis peridii firme conjunctis, subimbricatis, subrhomboideis v. oblongis, 25–40 \times 15–22.5 μ , pariete exteriore striato, 10–12.5 μ crasso, interiore verrucoso, 4–5 μ crasso. Aecidio-sporae hyalinae v. subhyalinae, ovatae, oblongae v. irregulariter angulatae, 19–30 \times 14–17.5 μ , minute denseque verruculosae, membrana 1–1.5 μ crassa, saepius ad apicem leniter incrassata (usque 4 μ).

Hab. in ramulis *Pentziae globosae* Less., prope Windsorton, leg. Acocks, 30661.

The fungus attacks the young shoots, which become thickened and branch abnormally, causing a tufted "witches' broom" effect.

***Aecidium spinicolum* Doidge nov. spec.**

Aecidia in spinis tantum evoluta, eos deformantia et gallas irregulares formantia, totam superficiem gallarum obtegentia, profunde immersa, vix vel parum exserta, 350–500 μ diam., margine albo non vel vix recurvato, leniter inciso; cellulis peridii firme conjunctis quoad formam valde variabilis, irregulariter angulatis, 25–40 \times 12.5–22.5 μ , pariete exteriore striato, 7.5–10 μ crasso, interiore verrucoso, 3–4 μ crasso. Aecidiosporae irregulares plerumque ovatae v. ellipsoideae saepe angulatae, ad apicem interdum mucrona-

tae, dense minuteque verruculosae, hyalinae v. subhyalinae, $20-34 \times 15-22.5 \mu$; episporio ca. 1.5μ crasso, ad apicem saepe leniter incrassato, $2.5-3 \mu$ rarius usque 4μ .

Hab. in spinis *Acaciae* sp. (= A. Karroo) Weenen, leg. Pentz, 30923.

This fungus appears to attack only the spines of the host, which in the specimen examined are up to 11 cm. long. It often forms comparatively small, elongated tumours, 1-3.5 cm. long, but occasionally almost the whole of the spine is involved, the gall being up to 14 mm. diam. and the spine deformed.

Aecidium spinicolum appears, ex description, to be closely related to *Ae. immersum* P. Henn., occurring on *Acacia abyssinica* in Erythraea, but the latter species occurs on young branches and has thicker-walled spores, more decidedly thickened at the apex; no mucro is mentioned.

***Cronartium Zizyphi* Syd. and Butl.**

in Ann. Myc. X (1912) p. 268; Syd. Monogr. Ured. III (1915) p. 579.

Uredo Zizyphi Pat., in Bull. Soc. Myc. Fr. XII (1896) p. 135.

Uredo-sori hypophyllous, scattered or in groups, not on leaf spots, but causing some indefinite discolouration of the leaf tissues, round to irregular, minute, punctiform or up to 0.3 mm. diam., light cinnamon-brown. Paraphyses very numerous, more or less incurved, clavate, golden-brown, often rather gnarled and irregularly curved and bent, $35-70 \mu$ long, $8-14 \mu$ broad; at the base and on the concave side thin-walled, wall about 1μ thick; at the apex and on the convex side, wall $4-5 \mu$ or occasionally up to 6μ thick. Uredospores sometimes few in number, the sorus consisting mainly of paraphyses, mostly ovate or ellipsoid, less frequently subglobose, yellow-brown, moderately echinulate, $19-33 \times 15-21 \mu$, epispore ca. 1.5μ thick; germ pores obscure.

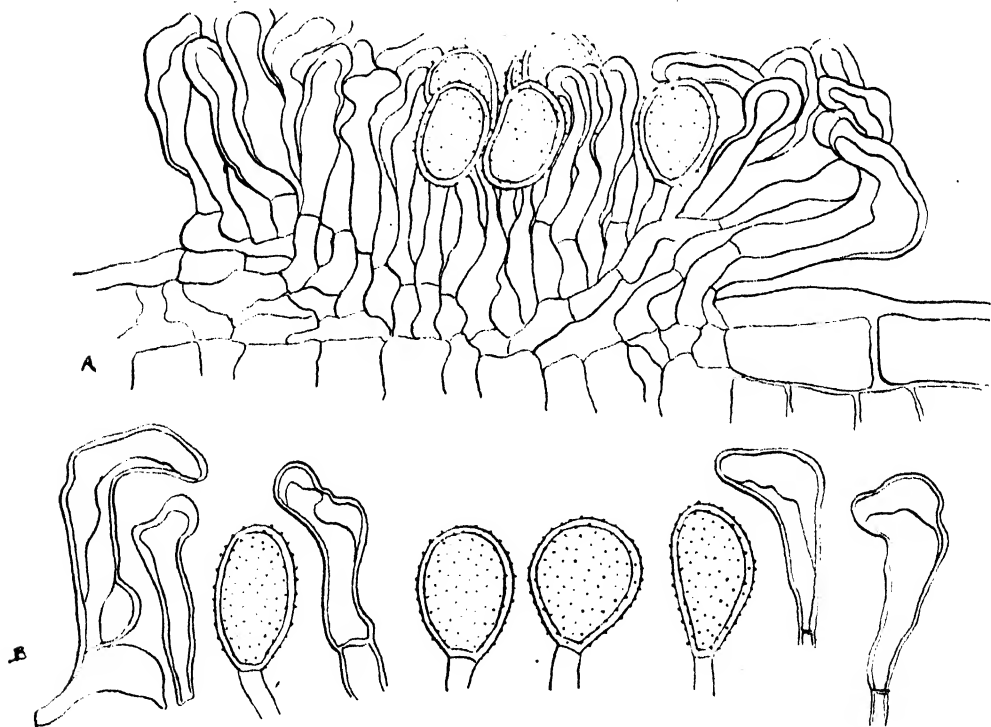


Fig. 1.—*Cronartium Zizyphi*;
(a) Section through uredo-sorus.
(b) Individual uredospores and paraphyses.

(Teleuto-sori arising from the centre of the uredo-sorus, filiform, straight or slightly curved, rusty-brown, 1.5–2.5 mm. long, 35–70 μ thick. Teleutospores cylindrical, smooth, yellow, 40–50 \times 8–11 μ ; epispore 1 μ thick.)

on *Zizyphus mucronata* Willd., on leaves, between Acornhoek and Tzaneen, Liebenberg 3608, 32724.

Only the uredo form is present on the specimen quoted, the description of the teleuto-sori being taken from Sydow and Butler (l.c.). The uredo is very characteristic and agrees in every detail with the description of the uredo of *Cronartium Zizyphi*; a number of rusts described from India have been found to occur in South Africa.

***Puccinia Allii* (DC) Rud.**

in Linnaea IV (1829) p. 392; Syd. Monogr. Ured. I (1904) p. 614.

Uredosori amphigenous, scattered or crowded and becoming more or less confluent, ellipsoid or oblong, usually up to 0.5 mm. long; at first covered by the blistered epidermis, which ruptures longitudinally but remains partly veiling the yellowish-brown spore masses. Uredospores broadly ellipsoid or subglobose, 25–35 \times 17.5–22.5 μ ; wall 1.5–2 μ thick, finely and rather sparsely echinulate; germ pores 5–8, scattered.

Teleutosori amphigenous, scattered or in irregular groups, oblong or irregular in form and size, black, compact, remaining covered by the epidermis; often developing in oval to ellipsoid rings round the uredosori, the rings being up to 3 mm. long and 1 mm. broad. Teleutosori compound, composed of closely crowded individual sori; these are mostly 60–100 μ diam. and 100–125 μ deep, each surrounded by an envelope of firm, palisade-like golden-brown paraphyses. Teleutospores rather variable in form, mostly oblong-clavate to clavate, rather pale golden-brown, deeper brown at the apex, 45–80 \times 20–27.5 μ ; rounded, truncate or bluntly conical, sometimes oblique, at the apex, attenuate at the base; more or less constricted at the septum; wall smooth, 1.5–2 μ thick, slightly thickened at the apex, up to 8 μ . Pedicel hyaline, short, sub-persistent.

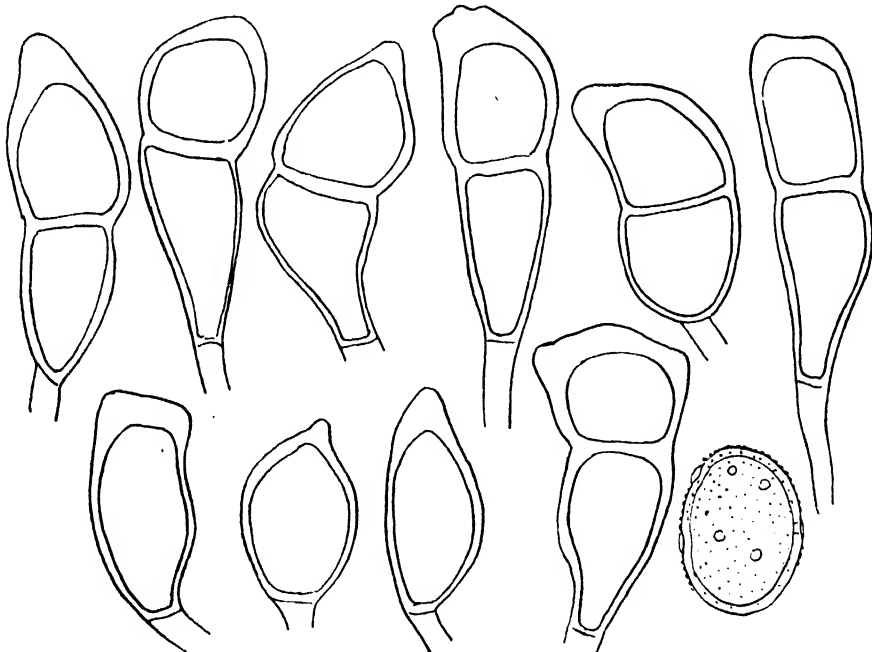


Fig. 2.—*Puccinia Allii*. Teleuto- meso- and uredo-spores.

Mesospores present, fairly numerous, similar in form to the upper cell of the teleutospore, ca. $40-45 \times 17.5-20 \mu$.

on *Allium sativum* Linn., leaves and peduncles, Joubertina, Reinecke, 32390, 32687, 33332; Oudtshoorn, du Plessis, 33926.

Sydow (l.c.) mentions two species of *Puccinia* on *Allium* which have compact, paraphysate teleutosori:—

Puccinia Blasdalei Diet. et Holw. which has aecidia; it is an autoecious species and mesospores are found in the teleutosori. It occurs in America.

Puccinia Allii (DC.) Rud. which has neither aecidia nor mesospores; it is known on *Allium sativum* as well as on a number of other *Allium* spp., and occurs mostly in the Mediterranean region, including Algeria and Abyssinia.

Sydow also states that he had two *Puccinias* on *Allium sativum* and *Allium Dregeanum* from the Cape, the former having many, the latter few mesospores. He considers that these rusts are near *Puccinia Blasdalei*, but doubts whether they belong to this species.

The South African rust on garlic, described above, is in complete agreement with *Puccinia Allii* except for the presence of mesospores, and it is assigned to this species until further studies can be made. During recent years this rust has become destructive in plantings of garlic in the Long Kloof area of the Cape Province.

There is no specimen of rust on *Allium Dregeanum* in the Pretoria Herbarium, and attempts to find a rust on this host have not been successful.

***Puccinia canaliculata* (Schw.) Lagerh. var. *tenuis* Doidge var. nov.**

A typo differt teleutosporis $35-65 \times 11-15 \mu$, tenuioribus et pallidioribus; pedicello usque 50μ longo; aecidiis ignotis.

Hab in foliis *Cyperi esculenti*, Brits., leg. F. M. du Toit, 33120.

Uredosori mostly hypophyllous, scattered, oblong, $0.5-2$ mm. long, long remaining covered, but at length dehiscent by longitudinal slits, the ruptured epidermis being conspicuous on either side of the somewhat pulverulent spore masses. Uredospores broadly ellipsoid to ovate, $19-29 \times 13-19 \mu$; epispore yellowish or cinnamon-brown, uniformly $1-2 \mu$ thick, moderately and finely echinulate; germ pores 2, equatorial.

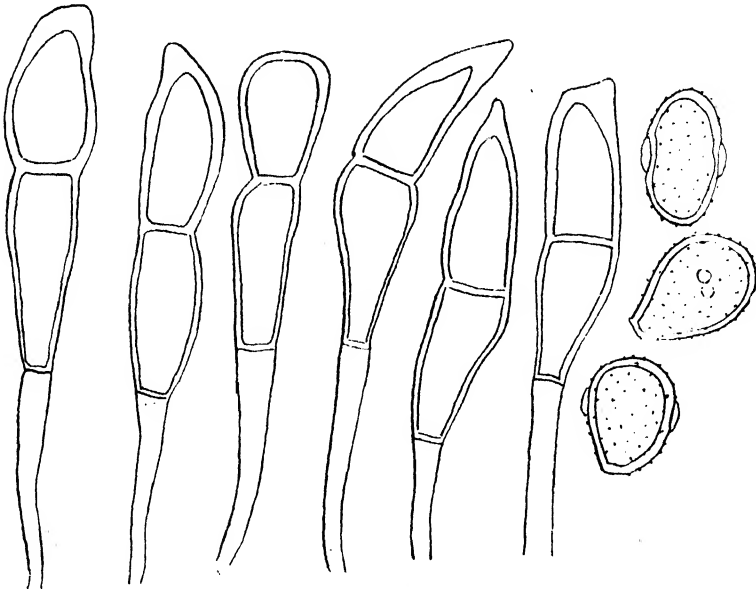


Fig. 3—*Puccinia canaliculata* var. *tenuis*. Teleuto- and uredo-spores.

Teleutosori hypophyllous, black or greyish-black, scattered or, more frequently, confluent in groups, 1-3 mm. long or longer, long covered by the epidermis, not raised above the leaf surface or only slightly so; individual sori linear, 100μ or less in diameter, surrounded by a well developed stroma which is chestnut-brown immediately below the crowded sori, becoming paler as it extends towards the upper epidermis; individual sori separated by dark or paler chestnut-brown, palisade-like paraphyses. Teleutospores clavate-oblong, $35-65\mu$ long, $11-15\mu$ broad, acuminate, obtuse or rounded at the apex, not constricted at the septum or slightly so, gradually attenuate at the base; epispore pale cinnamon-brown at the apex, paler towards the base, ca. 1μ thick, thickened at the apex, $3-8\mu$; pedicel persistent, tinted, up to 50μ long.

on *Cyperus esculentus* Linn., on leaves, Hartebeestpoort, Brits, *F. du Toit* 33120; Fort Beaufort, *Pole Evans* 302; II. Groenkloof, *Pole Evans*, 8930; Tweedie, *Mogg.* 23149; Hartebeestpoort, Brits, *Doidge and Bottomley*, 33270; Malagazi, Natal, *Wager*, 32719.

The South African rust was compared with an American collection on the same host (*Reliquiae Holwayana* 176) and with the description given by Kern (*Mycologia* XI, 1919, p. 136) in his studies on rusts on *Cyperus* and *Eleocharis*. In his key, *Puccinia canaliculata* (Schw.) Lagerh. is characterised by uredo-spores with two equatorial germ pores and wall uniformly $1-2\mu$ thick. The stromatic tissue beneath the paraphysate teleuto-sori is also characteristic.

The South African rust on *Cyperus esculentus* differs only in the form of the teleutospores, which are consistently more slender, $11-15\mu$ broad, compared with $15-21\mu$ in the type.

***Puccinia Dichondrae* Mont.**

in Gay, Fl. Chil. VIII (1853) p. 46 et Crypt. (1856) p. 313. Syd. Monogr. Ured. I (1904) p. 321.

Puccinia Duthiei van der Byl in S. Afric. Journ. Sci. 24 (1927) p. 226.

Teleutosori hypophyllous, not causing leaf spots, very numerous and closely crowded, often occupying the whole leaf surfaces; at first veiled by the leaf hairs, very minute and difficult to detect, then slightly larger, punctiform, subpulverulent, deep cinnamon-brown. Teleutospores oblong or oblong-clavate, sometimes asymmetrical and irregular, $25-45 \times 14-19\mu$, occasionally up to 24μ broad; more or less rounded or broadly conical at the apex, which is furnished with a hyaline or subhyaline papilla $1-6\mu$ long and $5-7.5\mu$ broad at the base; rounded or somewhat attenuate at the base; slightly constricted at the septum, cells usually sub-equal; epispore smooth, thin, ca. 1μ thick, not thickened at the apex; pedicel delicate, subhyaline, up to 25μ long, ca. 5μ thick at the apex.

on *Dichondra repens* Forsk., on leaves, Grahamstown, *Archibald*, 33278; Belvidere, Knysna, *Duthie* (v. d. Byl 2337).

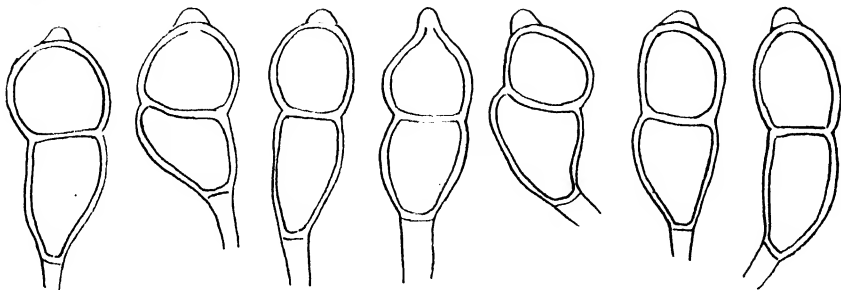


Fig. 4.—*Puccinia Dichondrae*. Teleutospores.

The type specimen of *Puccinia Duthiei* is v. d. Byl 2337; on this specimen there is a note in Miss Duthie's handwriting that the host is "possibly *Falkia repens*"; the plant was not found in flower. On comparison with specimens in the National Herbarium, there seems to be no doubt that the host is *Dichondra repens*, a somewhat similar plant, and that *Puccinia Duthiei* is identical with *P. Dichondrae*. The aecidia have not been found.

***Puccinia Helianthi* Schw.**

O.I. Not seen.

II. Uredosori chiefly hypophyllous, not on leaf spots, pulverulent, cinnamon-brown. Uredospores globose, broadly ellipsoid or ovate, yellow-brown to brown, $22-34 \times 19-26 \mu$; episore dark cinnamon-brown, $1-2 \mu$ thick, finely echinulate, with 2 equatorial germ pores.

III. Teleutosori amphigenous, but more numerous and conspicuous on the under side of the leaf, scattered, or in groups and becoming confluent, round, pulvinate, compact, blackish-brown, 0.5-2 mm. diam. Teleutospores ellipsoid, or oblong; at the apex more or less broadly rounded or obtusely conical, slightly constricted at the septum, rounded at the base, $35-58 \times 20-30 \mu$, episore chestnut-brown, smooth, $1.5-3 \mu$ thick, thickened at the apex, which is paler, $6-12 \mu$; germ pores apical and just below the septum. Pedicel hyaline, stout, persistent, $8-10 \mu$ thick and up to 115μ long.

on leaves of *Helianthus annuus* Linn., Bulawayo, Hopkins (Rh. 5988) 34031; Naboomspruit, 34051; Buffelspoort, Redpath, 34077.

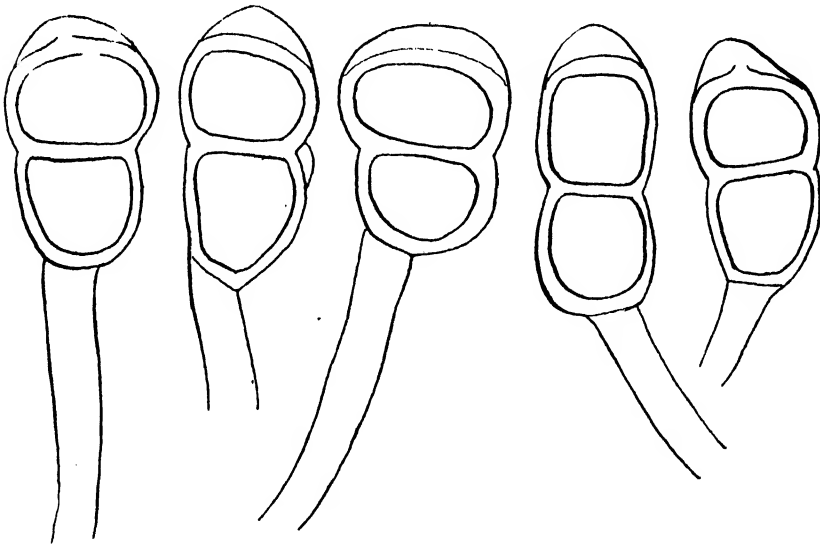


Fig. 5.—*Puccinia Helianthi*. Teleutospores.

The sunflower rust is apparently a recent introduction into southern Africa. In 1943, it was collected at Bulawayo by Hopkins and at Umbeluzi, Mozambique, by Cardoso. A report was received of a destructive outbreak of "rust" in commercial plantings of sunflowers in the northern Transvaal, in 1943, but it was not until January, 1944, that specimens were sent from Naboomspruit and identified as *Puccinia Helianthi* Schw.

***Puccinia Isoglossae* Doidge.**

Bothalia II (1927) 72, 208.

The hosts of this fungus were wrongly determined; they are not *Isoglossa ovata* Nees and *I. Woodii* C.R.Cl., but *Hypoestes* sp. (No. 2399) and *Hypoestes verticillaris* R. Br. (No.

9075). Only teleutospores have been found on these two collections. *Uredo Hypoestis* Cooke and *Aecidium Acanthacearum* Cooke occur fairly commonly on species of *Hypoestes* and *Isoglossa*, but in the material available for study, no evidence could be found of any connection between these forms and *Puccinia Isoglossae*.

***Puccinia Krookii* P. Henn.**

in Ann. Naturhist. Hofmus. Wien (1900) p. 1; Syd. Monogr. Ured. I (1904) p. 426; Doidge, *Bothalia* II (1927) p. 88.

This rust was originally collected at Harrismith by Krook on *Epilobium* sp., a number of subsequent collections having been made on *Epilobium hirsutum* (Doidge l.c.). According to Sydow, this species differs from *Puccinia Epilobii-tetragoni* on *Epilobium hirsutum* (DC.) Wint. in the absence of aecidia and the larger teleutospores tapering to the pedicel.

Recent collections have again been compared with *Puccinia Epilobii-tetragoni* on *Epilobium hirsutum* (Syd. Myc. Germ. 1464, 1465). *Puccinia Krookii* was collected by Mogg at Pyramids near Pretoria, the uredo- and teleuto-forms in January, 1940 (32434) and an aecidium on the same host and in the same locality in December 1939 (32654); some of the aecidia on the last-named collection are rather old and a few typical uredosori of *P. Krookii* have developed on the same leaves.

There is no difference between the aecidia of the two species; there is no significant difference in the size of the uredospores and the germ pores appear to be similarly placed, but the uredospores of *P. Krookii* are usually darker and the germ pores more conspicuous. The teleutospores of *P. Krookii* are definitely longer and more frequently attenuated towards the pedicel; they have a darker, finely punctuate episporium; in teleutospores of *P. Epilobii-tetragoni* the episporium is smooth. The two rusts are evidently very closely related.

The aecidium of *P. Krookii* may be described as follows:—

Aecidia hypophyllous, distributed equally and closely over the whole leaf surface, cupulate, 250–350 μ diam.; margin of the peridium white, lacinate, revolute; cells of the peridium firmly joined together, mostly more or less rhomboid, 20–27.5 \times 15–25 μ , outer wall finely striate, 5–6 μ thick, inner verrucose, 3–4 μ thick. Aecidiospores mostly ovate to broadly ellipsoid or oblong, often angular, 19–22.5 \times 12.5–17.5 μ , very minutely verrucose, wall ca. 1.5 μ thick.

on *Epilobium hirsutum* Linn., Pyramids, near Pretoria, Mogg, 32645.

***Puccinia Le Testui* Maubl.**

in Bull. Soc. Myc. Fr. XXII (1906) p. 71.

Aecidia on reddish-brown, indefinite leaf spots, hypophyllous, solitary or in small irregular groups of 2–5, scattered over the leaf surface, cupulate, 150–200 μ diam. Peridium white, margin lacinate; cells of the peridium rhomboid, rather loosely connected, 19–35 \times 16–19 μ , outer wall striate, 4–5 μ thick, inner verrucose, 3–4 μ thick. Aecidiospores angular globose to ellipsoid, subhyaline, densely and minutely verruculose, 18–24 \times 16–20 μ ; episporium ca. 1 μ thick.

Teleutosori hypophyllous, interspersed with the aecidia and causing a similar reddish- or purplish-brown discolouration of the leaf tissues, scattered or in small irregular groups, black, pulvinate, compact, round or elliptic in outline, up to 1 mm. diam.; at first covered by the blistered epidermis, which ruptures irregularly and often remains partly veiling the compact spore masses. Teleutospores oblong or oblong-clavate, chestnut-brown; usually rounded at the apex, less frequently subtruncate or obtusely conical, in the latter case sometimes more or less oblique; attenuate, rarely somewhat rounded at the base; slightly constricted at the septum, cells sub-equal in length or the upper somewhat shorter, 36–52.5 \times 16–25 μ ; episporium smooth, 2–2.5 μ thick, thickened at the apex, up to 8 μ ; germ pores

apical and just below the septum; pedicel stout, persistent, up to $50\ \mu$ long, $6-8\ \mu$ broad at the apex, slightly tinted. Mesospores present, ellipsoid or subclavate, $28-45 \times 16-20\ \mu$. on *Vernonia glabra* Vatke, Rusapi, R. Rhodesia (Rh. 4096) 33425.

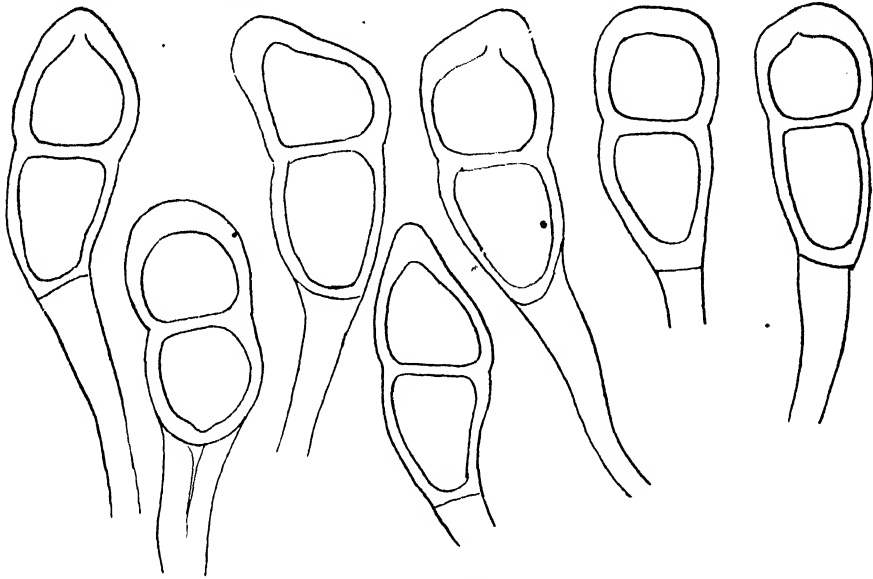


Fig. 6.—*Puccinia Le Testui*. Teleutospores.

Puccinia Le Testui was described by Maublanc on a *Vernonia* sp. "e sect. Decaneuron", collected at Marromen, Mozambique; *Vernonia glabra* also belongs to that section of the genus.

In the material examined, there is a fairly distinct, apical germ pore in the teleutospores and—especially in spores tapering to the apex—a paler area at the apex, but there is no distinct papilla. With this exception, the Rhodesian rust agrees exactly with the description of the type.

***Puccinia natalensis* Diet. and Syd. var. *Evansii* Doidge.**

This variety was described from two collections from the northern Transvaal of a plant identified as *Lantana salviafolia*. A more critical examination reveals that the host is not a *Lantana*, but a species of *Lippia*. The rust does not differ in any essential from *Puccinia lippivora* Syd.

Puccinia natalensis var. *Evansii* must therefore be regarded as a synonym for *P. lippivora*, the particulars being as follows:—

***Puccinia lippivora* Syd.**

Syn: *Puccinia natalensis* Diet. and Syd. var. *Evansii* Doidge in *Bothalia* II (1927) p. 82.

on *Lippia* sp., Barberton, *Pole Evans*, 1850; Duivelskloof, *Doidge*, 1816.

***Puccinia Tetragoniae* McAlp.**

McAlpine in *Agric. Gaz. of New South Wales* VI (1895) p. 854; Syd.

Monogr. Ured. I (1904) 563; Cunningham, *The Rust Fungi of New Zealand* (1931) p. 146.

var. ***austro-africana* Doidge var. nov.**

A typo differt uredosporis minoribus, $20-26 \times 17.5-20 \mu$, episporio tenuiore $1.5-2 \mu$ crasso; teleutosoris cauliculis, teleutosporis minoribus, $30-50 \times 22.5-35 \mu$.

Hab. in foliis caulisque *Tetragoniae expansae*, Pietersburg, leg. Palte, 34095.

O.I. Pycnidia and acidia not seen.

II. Uredosori amphigenous, mostly hypophyllous, scattered or in irregular groups, usually subcircular, sometimes elongated or irregular in outline, $0.5-1$ mm. diam., cinnamon-brown, surrounded by the torn epidermis. Uredospores obovate, ellipsoid or subglobose, $22.5-32 \times 17.5-25 \mu$; epispore pale yellow, rather closely and coarsely echinulate, $1.5-2 \mu$ thick; germ pores rather conspicuous, $5-6$, scattered.

III. Teleutosori caulicolous, none seen on the leaves in the South African material, in elongated, more or less elliptical groups, which sometimes coalesce; single sori almost round to elliptic, up to 1 mm. long, long remaining covered, later naked, black, bullate, surrounded by the torn epidermis. Teleutospores ellipsoid, subclavate or irregular in form, occasionally broader than long, deep chestnut-brown, $30-50 \times 22.5-35 \mu$; apex usually rounded, sometimes truncate or conical, occasionally oblique; base rounded, seldom attenuate; slightly constricted at the septum, cells usually sub-equal, but the lower sometime, narrower or broader than the upper; epispore smooth, $3-4 \mu$ thick, not thickened at the apex, or slightly thickened, $5-6 \mu$, rarely up to 8μ ; germ pores apical and just below the septum; pedicel persistent, slightly tinted at the apex, up to 35μ long and 8μ broad. Mesospores fairly numerous, clavate or irregular in form, $30-40 \times 22-30 \mu$, similar in character to the teleutospores.

on *Tetragonia expansa* Murr., "New Zealand Spinach", on leaves and stems, Pietersburg, April 1944, Palte, 34095; Wellington, Verwoerd (Stell. 471); Stellenbosch, Verwoerd (Stell. 369).

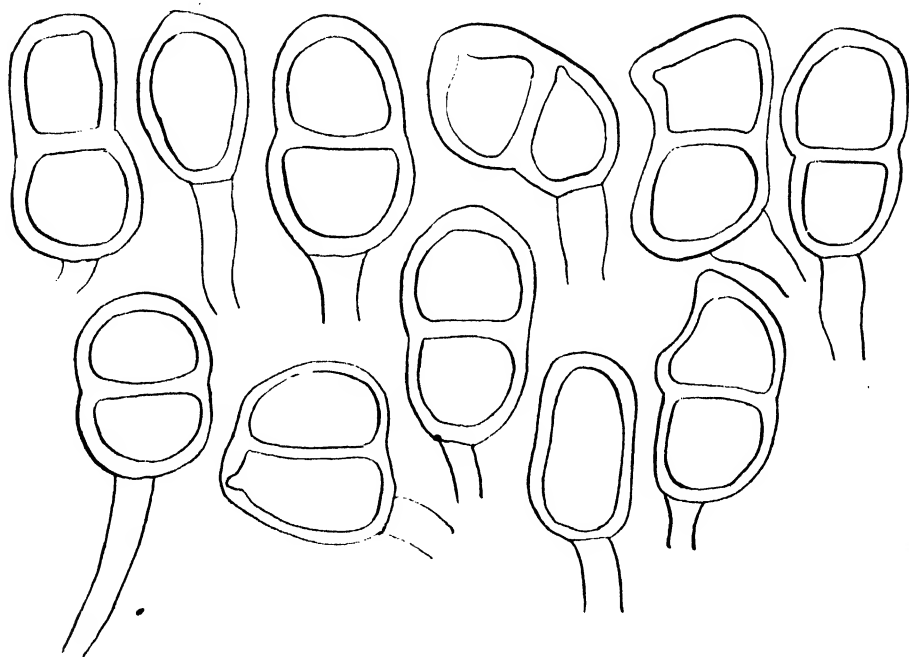


Fig. 7.—*Puccinia Tetragoniae* var. *austro-africana*. Teleutospores and mesospores.

To Dr. Cunningham I am indebted for material of two collections of *Puccinia Tetragoniae* McAlp. from New Zealand, one on *Tetragonia trigyna* and the other on *Tetragonia expansa*. Dr. Cunningham states that specimens of *T. implexicoma* from McAlpine's herbarium in

Melbourne, forwarded to him by C. C. Brittlebank, carried spores, which though slightly smaller, agreed so closely with those of the New Zealand rust, that he referred collections of the latter to McAlpine's species.

On the other hand, a comparison of the New Zealand material with the South African collections has confirmed the view that the South African rust should be regarded as a distinct variety. Collections from the Stellenbosch herbarium, kindly supplied by Dr. Dippenaar, agree in every particular with those from the Northern Transvaal.

Comparative measurements are as follows:—

Australian collections (McAlpine).....	Uredospores 27-32 × 22-25 μ . Teleutospores 39-59 × 25-31, av. 50 × 28 μ .
New Zealand collections (Cunningham) ..	Uredospores 28-36 × 22-28 μ . Teleutospores 52-60 × 32-40, av. 56 × 36 μ .
South African collections.....	Uredospores 22.5-32 × 17.5-25 μ . Teleutospores 30-50 × 25-35, av. 40 × 27.5 μ .

The sori and spores of the South African collections are similar in character to those of typical *Puccinia Tetragoniae*, but the spores are consistently smaller and thinner walled. The teleutospores are cauliculous and not amphigenous as described by Cunningham for the type.

Ravenelia atrides Syd.

in Ann. Myc. X (1912) p. 438; Monogr. Ured. III (1915) p. 307; Doidge Bothalia II (1927) p. 153.

on *Grewia monticola* Sond., Nelspruit, Doidge, 32401.

Grewia kwebensis N.E. Br., Olifants River Camp, Kruger National Park, Liebenberg 3609, 32731.

This rust, previously only known from the Natal coast on *Grewia caffra* and *G. occidentalis*, has now been found in the eastern Transvaal on the hosts mentioned above.

Ravenelia Baumiana P. Henn.

in Bot. Ergebnisse der Kunene-Sambesi Exped. (1903) p. 157; Syd. Monogr. Ured. III (1915) p. 262; Doidge, Bothalia II (1927) p. 148.

on *Cassia delagoensis* Harv., Schagen, Liebenberg 3579, 30955; Nelspruit, Doidge, 32404.

This is a new host record; *Ravenelia Baumiana* was originally collected by Baum at Humbe, South West Africa on *Cassia goratensis* Fres., it has also been found in Southern Rhodesia on that host.

Ravenelia MacOwaniana Pazschke.

The teleutospores of this rust are described as occurring on the leaves, amphigenous round, 0.5-1 mm., diam., dark brown. A recent collection (32169) on *Acacia Karroo* Hayne, made by Dr. Leeman at Grahamstown, shows teleutospores produced in groups on slightly thickened branches; large incrustations are formed, extending along the small branches to a length of 1-6 cm. The sori develop on the inner bark, pushing up the outer bark, which becomes detached in superficial scales. Only a few leaflets were included in the collection and on those typical sori were observed. The spores from sori on branches are indistinguishable from those found in the leaf sori.

Ravenelia modesta Doidge.

in *Bothalia* III, l t. IV; p. 504 (1939).

Aecidia fructicolous, in more or less circular groups, up to 1 cm. diam., on somewhat hypertrophied parts of green legumes, closely and fairly evenly distributed, deeply immersed (ca. 500 μ) in the tissues of the host, the torn epidermis forming a collar round the upper part of the peridium, which is exerted up to 500 μ . Aecidia 300–400 μ diam., briefly cylindrical, margin erect, denticulate. Cells of the peridium imbricate, firmly jointed together, very irregular in form and size, often rhomboid or oblong, mostly 30–50 \times 12.5–20 μ ; outer wall striate, 7.5–9 μ thick, inner verrucose, 3–4 μ thick. Spores ovate, subglobose or irregular in form, often angular, pale, 21–28 \times 12.5–21 μ ; wall subhyaline 2–2.5 μ thick, not thickened at the apex, very finely and closely verruculose.

Separate uredo-sori not seen; uredospores found round the margin of the teleutosori, pale, ellipsoid, ovoid or subglobose, 25–35 \times 15–25 μ ; epispore ca. 2 μ thick, finely and rather distantly verruculose-echinulate; germ pores numerous, scattered. Paraphyses numerous, pale fuscous, clavate or clavate-spathulate, occasionally subcapitate, straight or curved, 40–50 μ long; 7.5–10.5 μ thick at the apex.

on leaves and pods of *Acacia Gillettiae* Burt Davy, Bosplaas, between Hamanskraal and Pienaars River, 21/3/45, A. O. D. Mogg, 34572.

The teleutospores of *Ravenelia modesta* were described and illustrated (Doidge, l.c.) from sori occurring on leaves of *Acacia stolonifera* Burch.; a re-examination of the type material reveals a few uredospores at the margin of the teleutosori, but these are parasitised, by *Darlucifilum*. In the collection quoted above on *Acacia Gillettiae*, a closely related species of *Acacia*, there are well-developed aecidia and fairly numerous uredospores in the teleutosori.

Uredo Dombeyae Doidge nov. spec.

Sori amphigeni, sparsi, primitus sine maculis, minuti, ca. 0.5 mm. diam., plus minus rotundati, mox nudi, brunnei, deinde majores, ca. 3 mm. diam. maculis brunneis ca. 5 mm. diam. insidentes. Uredosporae plerumque ovatae, rarius subgloboae, ellipsoideae v. clavatae, subhyalinae v. pallide flavo-brunneae, remote aculeatae, aculeis usque 1 μ longis, 32.5–50 \times 20–27.5 μ , episporio 4–5 μ crasso, nonnunquam usque 6 μ , ad apicem incrassato, 8–12 μ , poris duobus distinctis aequatorialibus oppositis praedita.

Hab. in foliis *Dombeyae natalensis* Sond., Stella Bush, Durban, leg. Wager, 33193.

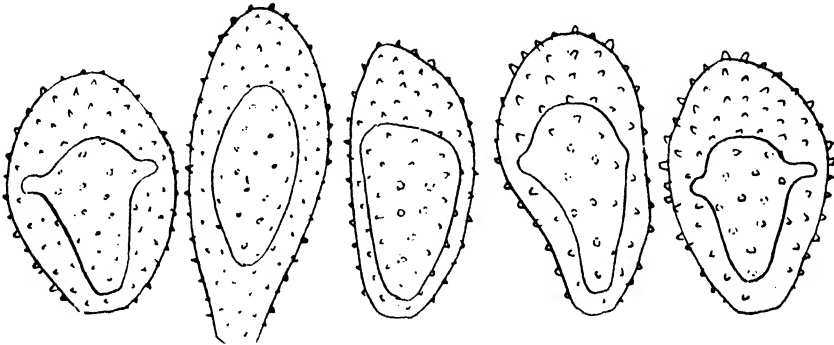


Fig. 8—*Uredo Dombeyae*. Uredospores.

Uredo Ehrhartae-calycinae Doidge nov. spec.

Sori amphigeni elliptici sparsi vel hinc inde aggregati sed haud confluentes elliptici, 0.5–1.5 mm. longi, primitus epidermide tecti dein ea fissa cincti, pulverulentes, cinnamomei, Spori ovati, ellipsoidei v. subgloboi, pallide brunnei v. flavo-brunnei, 20–29 \times 17.5–20 μ , verruculoso-echinulati, episporio 3.5–4 μ crasso, prois germ. 4–6 sparsis praedito.

Hab. in foliis *Ehrhartae calycinae*, Stellenbosch, leg. Verwoerd (Herb. Stell. Elsenburg Coll. Agric. 41) 34098.

No uredo has been found associated with *Uromyces Ehrhartae-giganteae* Doidge of which several collections on *Ehrharta gigantea* have been examined, and no teleutospores are to be found on the collections of *Ehrharta calycina* available.

Uromyces Ehrhartae McAlp., which occurs on a grass of a closely related genus, *Microlaena stipoides* R. Br., has uredo-sori which closely resemble those of *Uredo Ehrhartae-calycinae*. According to McAlpine's description (The Rusts of Australia, 1906, p. 86) the uredospores are subglobose to oval, orange, finely echinulate, $21-25 \times 18-20 \mu$, with 3-4 scattered germ pores on one face. The thickness of the wall is not mentioned. The South African rust described above, has very thick-walled spores, which are coarsely verruculose-echinulate and have 4-6 scattered germ pores.

***Uredo rhoina* Syd.**

in Deutsche Zentral Afrika Exped. 1907/8, Berlin (1910) p. 97; Monogr. Ured. IV (1924) p. 456.

Uredosori hypophyllous, scattered or becoming numerous and crowded, very minute or up to 2 mm. diam., cinnamon-brown, early becoming naked, pulverulent, more or less concealed amongst the stellate hairs on the leaf of the host. Uredospores very variable in form, ovate, ellipsoid, subglobose, oblong or clavate, $20-35 \times 15-21 \mu$; epispore ca. 1.5μ thick, often somewhat thickened (up to 5μ) at the apex, which is rounded or bluntly conical; briefly verrucose-aculeate, being closely set with acute verrucae arranged in indistinct longitudinal rows; germ pores 2-3 equatorial.

on *Lannea discolor* Sond., leaves, Nelspruit, Doidge, 32395.

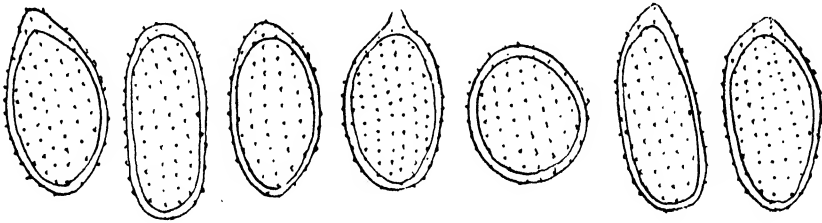


Fig. 9.—*Uredo rhoina*. Uredospores.

***Uromyces Aloes* (Cooke) P. Magn.**

in Ber. Deutsch. Bot. Gesellsch. X (1892) p. 48; Syd. Monogr. Ured. II (1910) p. 265; Doidge, Bothalia II (1927) p. 39.

on *Haworthia atilinea* Haw., Vincent, C.P., G. G. Smith, 33326.

Haworthia Reinwanatii Haw., Vincent, G. G. Smith, 33324.

Haworthia retusa (L.) Haw., Vincent, G. G. Smith, 33325.

Haworthia spp., Vincent, G. G. Smith, 33252, 33327.

This rust has been recorded on a large number of *Aloe* spp., and is extremely common on plants belonging to that genus; it has not been recorded on hosts belonging to other genera. The plants of *Haworthia* spp. found infected, were growing in cultivation near infected *Aloes*; the sori are comparatively small on these hosts, but the teleutospores are identical with those found on *Aloe* spp.

***Uromyces Cassiae-mimosoidis* Doidge nov. comb.**

Uredo Cassiae-mimosoidis Doidge in Bothalia IV (1941) p. 233.

Uredo-sori amphigeni, sparsi v. aggregati, rotundati v. elliptici, 0.5-0.75 mm. longi, interdum confluentes, ferruginei, pustuliformes, diutius epidermide pallida tecti, dein ea fissa cincti vel semivelati, pulverulenti. Uredosporae ovatae, ellipsoideae, subglobosae v. irregulares, $21-27.5 \times 16-21 \mu$ densiuscule breviterque echinulae, aureo-brunneae, episporio $1.75-2.5 \mu$ crasso, poris germ. 2-4, plerumque 3, equatorialibus, conspicuis.

Teleuto-sori conformes, cinnamomei. Teleutoeporae aureo-brunneae, ellipsoideae ovatae, subglobosae v. plus minus irregulares, interdum angulatae, $17.5-30 \times 12.5-17.5 \mu$, plerumque $20-25 \times 15 \mu$, ad apicem rotundatae, papilla hyalina $5-6 \mu$ lata, $1-1.5 \mu$ alta ornatae, verrucis majusculis fere hemisphericis ca. 1 mm. latis irregulariter obsitae, episporio $1.5-2 \mu$ crasso, apice haud incrassato; pedicello brevi, persistenti, hyalino.

Hab. in foliis Cassiae mimosoidis Linn., Buffelspoort, leg. Doidge et Bottomley, 32170.

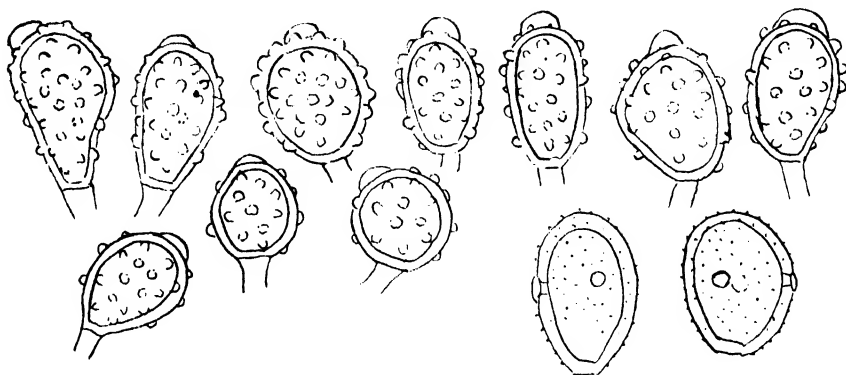


Fig. 10.—*Uromyces Cassiae-mimosoidis*. Teleuto- and uredo-spores.

The uredo-form was also found at Fairy Glen near Pretoria, Doidge, 30915, and at Donkerpoort, Pretoria Distr., Doidge and Bottomley, 29741.

***Uromyces euphorbiicola* (Berk. and Curt.) Tranzsch.**

in Ann. Myc. VIII (1910) p. 8; Syd. Monogr. Ured. II (1910) p. 16. sub *Uromyces proëminens* (DC) Lév. in Doidge, Bothalia II (1927) p. 10.

on *Euphorbia prostrata* Ait., Durban, Medley Wood, 809, 11124, 14200; Maritzburg, J.M. Sim, 9202; Pretoria, Pole Evans, 6962, Hean, 30643; Salisbury (Rh. 2072).

Some of the collections quoted were recorded in a previous paper (Doidge l.c.) as *Uromyces proëminens* (DC.) Lév., the host having been incorrectly determined as *Euphorbia inaequilatera* Sond.

The acidia and the uredo- and teleuto-sori of the two rusts are very similar, the chief difference being in the uredospores. In *Uromyces euphorbiicola* the uredospores have most commonly 3 equatorial germ pores, rarely 2 or 4. Uredospores of *U. proëminens* have 4-6 germ pores, most commonly 5, of which one is apical; the latter rust is not known to occur on *Eu. prostrata*.

***Uromyces Krantzbergensis* Doidge nov. spec.**

Teleuto-sori amphigeni, sparsi v. plures aggregati et dense dispositi, primitus elliptici, $4-6 \times 1.5-2$ mm., confluendo saepe usque 2 cm. longi et 4 mm. lati, epidermide bullata diu tecti dein ea semivelati, valde pulverulenti, cinnamomei. Teleutoeporae quoad formam variables, subglobosae, ovoidae v. oblongae, saepe plus minus angulatae, leves, pallide aureo-brunneae, $22.5-32.5 \times 22.5-27.5 \mu$, episporio ca. 2.5μ crasso, apice haud vel leniter incrassato ($4-5 \mu$); pedicello hyalino, deciduo, usque 50μ longo, apice $4-5 \mu$ crasso.

Hab. in foliis *Liliaceae* indet., Krantzberg, leg. Dyer, Verdoorn at Erens, 34505.

Sori amphigenous, scattered or in elliptic groups; single sori elliptic, $4-6 \times 1.5-2$ mm., usually becoming coalescent and forming larger sori up to 2 cm. long and 4 mm. broad, often occupying the whole width of the leaf; long covered by the pale, blistered epidermis, which finally ruptures but remains partly veiling the pulverulent, cinnamon-brown mass of spores.

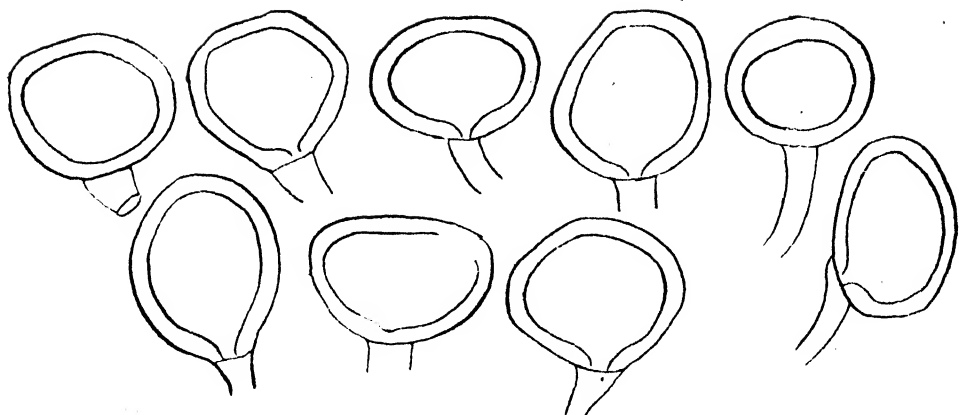


Fig. 11.—*Uromyces Krantzbergensis*. Teleutospores.

Teleutospores very variable in form, globose, flattened globose, ovoid or oblong, frequently broader than long and often more or less angular; broadly rounded or flattened at the apex, more or less rounded at the base; epispore smooth, pale golden-brown, ca. $2.5\ \mu$ thick, not thickened at the apex or very slightly so ($4-5\ \mu$), germ pore basal, immediately above the pedicel; pedicel deciduous, hyaline, up to $50\ \mu$ long, $4-5\ \mu$ thick at the apex and tapering downwards.

on leaves of *Liliaceae* undet., probably *Anthericum* sp., on Farm Waterval, western side of the Krantzberg, on slopes towards the Matlabas River, north-western Transvaal, 5/1/42, Dyer, Verdoorn and Erens 4197, 34505.

***Uromyces Maireanus* Syd.**

in Monogr. Ured. II (1910) p. 280; Doidge, Bothalia II (1927) p. 43.

Aecidia hypophyllous, rather closely crowded in elliptical groups up to 6 mm. long; at first closed, covered by the raised epidermis, then open, cupulate, $250-350\ \mu$ diam.; margin of the peridium white, erect, denticulate, surrounded by the torn epidermis. Cells of the peridium rather loosely connected, subrhomboid, oblong or irregular, $25-40 \times 15-22.5\ \mu$; outer wall smooth, $5-6\ \mu$ thick, inner finely verrucose, $2.5-4\ \mu$ thick. Aecidiospores yellow in mass; single spores subhyaline, globose, ovate or ellipsoid, often more or less angular, $20-27.5 \times 16-21\ \mu$; wall finely and closely verruculose, $1.5-2\ \mu$ thick.

on *Ornithogalum flavovirens* Bkr., on leaves, Grahamstown, Archibald, 33275, 33328.

The aecidium was not described by Sydow. On No. 33328, the aecidia are closely associated with the uredo- and teleuto-sori on the same leaves. This rust was originally described on *Ornithogalum sessiliflorum* collected by Maire in Algiers; in South Africa it has been found on *O. Roodeae*, collected at Clanwilliam, and on *O. flavovirens* as recorded above.

***Uromyces Polemanniae* Kalchbr. and Cooke.**

in Grevillea XI (1882) p. 21; Syd. Monogr. Ured. II (1910) p. 52; Doidge, Bothalia II (1927) p. 16.

on *Polemannia montana* Schlechtr. and Wolf, Bulwer, Natal, Haygarth, 33228.

This rust, which apparently is somewhat rare, has only been known from the type collection on *Polemannia grossulariaefolia* E. and Z., found near Somerset East by MacOwan. It has now been detected on a second host, *Polemannia montana*.

Uromyces Rhynchosiae Cooke emend. Doidge.

Uromyces ? *Rhynchosiae* Cooke, Grevillea X (1882) p. 24.

Uredo (*Trichobasis*) *Rhynchosiae* Kalchbr., Grevillea XI (1882) p. 24.

Puccinia Rhynchosiae Kalchbr. and Cooke, Grevillea XI (1992) p. 24.

Uromyces Dolichi Syd. (non Cooke) Monogr. Ured. II (1910) p. 122.

Uredospores hypophyllous, rarely a few scattered sori are to be found on the upper side of the leaf, minute, up to 0.3 mm. diam., scattered, often numerous, crowded and closely set over the whole leaf surface, but only occasionally becoming confluent, cinnamon-brown, pulverulent, surrounded by the torn epidermis. Uredospores globose, subglobose or broadly ellipsoid, golden-brown, $20-30 \times 18-22 \mu$, mostly $22-25 \times 18-20 \mu$; episporium golden-brown, $2.5-3 \mu$ thick, minutely and rather sparsely echinulate; germ pores equatorial, usually 3, less frequently 2 or 4.

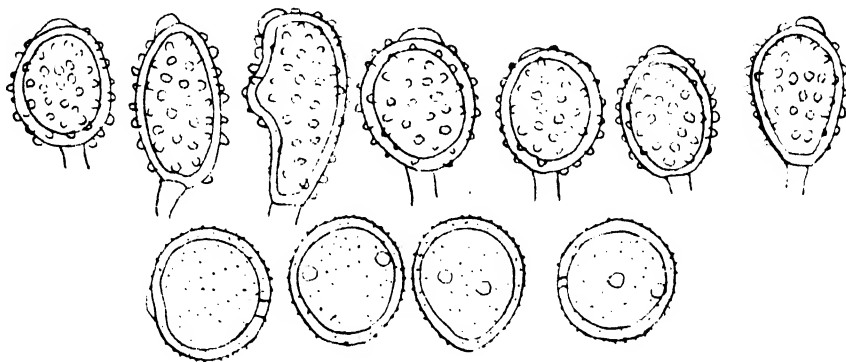


Fig. 12.—*Uromyces Rhynchosiae*. Teleuto- and uredo-spores.

Teleuto-sori similar to the uredo-sori but darker brown, pulvinate and less pulverulent. Teleutospores chestnut-brown, globose, ovate or ellipsoid, rounded at the apex, rounded or somewhat attenuate at the base, $18-27.5 \times 16-20 \mu$; usually papillate at the apex, the papilla being hyaline or subhyaline, flattened hemispherical, $6-7 \mu$ broad and $2.5-3 \mu$ high; episporium $2.5-3 \mu$ thick, not thickened at the apex, rather grossly verrucose, being set with rounded warts, irregularly placed; germ pore apical; pedicel short, hyaline, persistent.

on *Eriosema cajanoides* Benth., Schagen, Liebenberg, 29930.

Eriosema cordatum E. Mey., Inanda, *Medley Wood* 556, 621, 361, 10937, 11121, Kew.

Eriosema salignum E. Mey., Inanda, *Medley Wood* 528, 10618, Kew; Winkle Spruit, Pole Evans, 2371.

Eriosema spp., Entumeni, Haygarth, 14182; Lemana, Doidge, 1800, 1801.

Flemingia Grahamiana W. and A., Natal, *Medley Wood* 553, 610, 10627, Kew.

Rhynchosia adenodes E. and Z., *Medley Wood* 29, Type, 10502, Kew.

Rhynchosia caribaea DC., Garstfontein, Pole Evans, Pienaar, 8901; Donkerpoort, Doidge and Bottomley, 30082; Pretoria, Mogg, 26366; Durban, McClean, 31028; Waterkloof, Bosman, 32889.

Rhynchosia Harmsiana Linn., Kentani, Pegler, 7811.

Rhynchosia Memnonia DC. var. *prostrata* Harv., Hebron, Pole Evans, 9053.

Rhynchosia orthodanum Benth., Inanda, *Medley Wood* 565, 579, 848, 10635, 10636, 11150, Kew.

Rhynchosia secunda E. and Z., East London, *Doidge*, 22415.

Rhynchosia totta DC., Pretoria, *Pienaar*, 2136.

Rhynchosia spp. undet., Inanda, *Medley Wood* 24, 10595, *Medley Wood* 617, 10619 ; Garstfontein, *Pienaar*, 1427 ; Pretoria, *Pole Evans*, 1431 ; Tugela Valley nr. Mont aux Sources, *Doidge*, 14155, 14163 ; East London, *Pienaar*, 2171 ; Silikats Nek, *Bosman*, 29898.

There has been some confusion between *Uromyces Dolichi* Cooke and *Uromyces Rhynchosiae* Cooke, partly owing to incorrect identification of some of the host plants.

In Grevillea X (1882) p. 127, the following statement follows the name :

" *Uromyces Dolichi* Cooke :

I. *Aecidium Dolichi* Cooke, on leaves, petioles and legumes of *Dolichos arillaris* Inanda, *Medley Wood* 640.

II. *Uredo Dolichi* B. and Br., Fungi of Ceylon 829 ?

III. *Uromyces phaseolorum* forma in *Dolichi gibbosi* etc."

Aecidium Dolichi Cooke, *Medley Wood* 640 is *Synchitrium Dolichi* (Cke.) Gaumann. *Uredo Dolichi* B. and Br. is not a South African form and if the teleuto-form is "*Uromyces phaseolorum* forma" it is most probably *Uromyces Vignae* Barcl., which occurs on *Dolichos* spp. ; there is no description and Cooke quotes no numbers for the teleuto-stage. *Uromyces Dolichi* Cooke is probably a synonym for *Uromyces Vignae* Barcl. The description of *U. Dolichi* in Sydow's Monograph (l.c.) applies to *Uromyces Rhynchosiae* Cooke and cannot be connected with *U. Dolichi* Cooke ; again no numbers are quoted.

On the same page of Grevillea (Vol. X p. 127) *Uromyces Rhynchosiae* Cooke is characterised as follows :—

" I. *Aecidium Rhynchosiae* Cooke, on *Rhynchosia*, *Medley Wood* 557.

II. *Uredo* (*Trichobasis*) *Rhynchosiae* Kalchbr., on *Rhynchosia*, *Medley Wood* 29 ; on *Eriosema salignum*, *Medley Wood* 528, 556 ; on *Flemingia*, *Medley Wood* 553.

III. Not seen."

Aecidium Rhynchosiae Cooke, *Medley Wood* 557, is *Synchitrium Dolichi*. According to Sydow (Monogr. Ured. II, 1910, p. 350) *Uromyces Rhynchosiae* is only a uredo-form and to be excluded from the genus *Uromyces*. Portions of the collections quoted by Cooke and Kalchbrenner have been examined ; a few typical teleutospores were found mixed with the uredospores of *Medley Wood* 29, which must be regarded as Cooke's type for *Uromyces Rhynchosiae* ; this number is also quoted by Kalchbrenner (Grevillea XI, 1882, p. 24) as the uredo-form of *Puccinia Rhynchosiae* Kalchbr. and Cooke. The fungus has been re-described from No. 14163 on an undetermined species of *Rhynchosia*.

This rust is common on species of *Rhynchosia* and occurs also on *Eriosema* and *Flemingia* ; it has not been found on any *Dolichos* sp. Teleutospores are usually found rather late in the season, the best material having been collected in May and June.

***Uromyces saginatus* Syd.**

in Ann. Myc. 26 (1928) 132.

Teleutospores amphigenous ; single sori at first minute or of medium size, round or oblong, developing in series and becoming confluent and then 2 to 10 mm. long and 1 mm. broad ; compound sori finally developing concentrically and becoming lenticular in outline and up to 20 × 5 mm. Sori at first covered by the lead-coloured, raised epidermis, which ruptures and remains surrounding or partially veiling the pulverulent, rusty-brown spore masses. Teleutospores variable in form, subglobose, ovate, ellipsoid or oblong, almost always more or less angular, golden-brown, 28–52 × 20–35 μ , the majority 30–45 μ long ;

episore smooth, 5–8 μ thick, varying in thickness, the side or base—rarely the apex—being thicker than elsewhere. Pedicel hyaline, deciduous, ca. 6 μ thick and up to 55 μ long, slightly tinted at the apex.

on *Urginea altissima* Bkr., Heany Junction, Bulawayo, *Hopkins* (Rh. 5873).

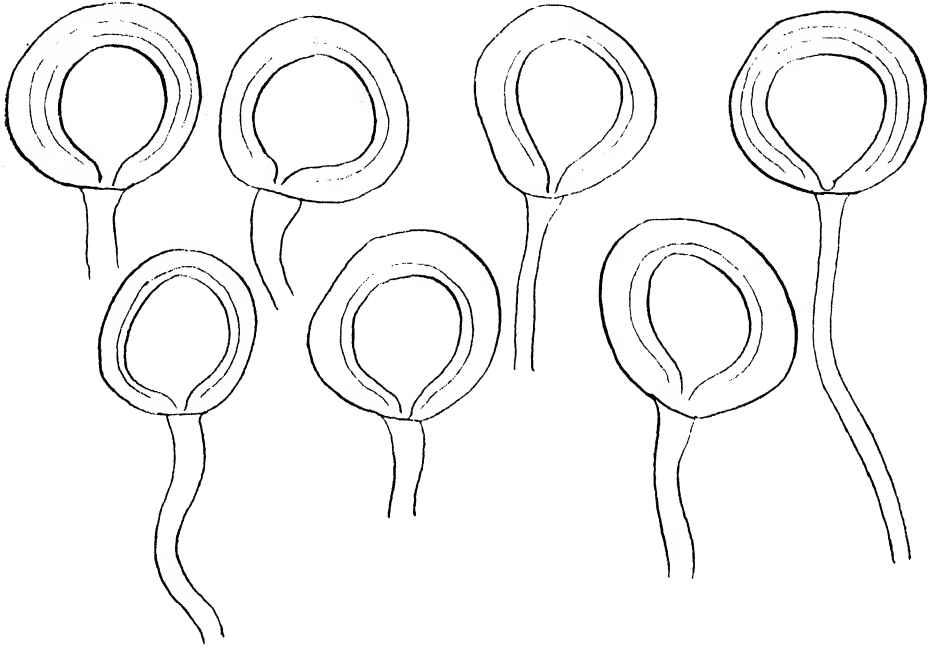


Fig. 13.—*Uromyces saginatus*. Teleutospores.

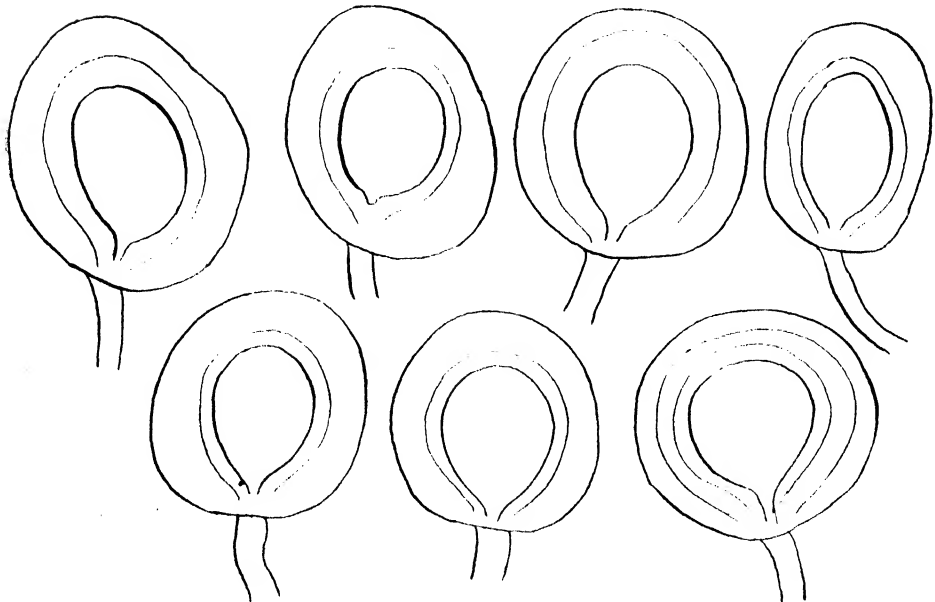


Fig. 14.—*Uromyces Holubii*. Teleutospores.

The type specimen, collected at Auros (Otavi) South West Africa, by Dinter (*K. Dinter 5673*) has not been seen, but the Bulawayo specimen is on the same host and conforms very closely to the original description. This species is similar to *Uromyces Holubii* Doidge, but the teleutospores are consistently smaller; drawings of the two rusts are reproduced for comparison, they appear to be distinct.

***Uromyces stellenbossiensis* v. d. Byl.**

in Duthie, Ann. Univ. Stell. VI A, No. 2 (1928) p. 4.

Uredo-sori similar to the teleuto-sori, but paler, or uredospores mixed with the teleutospores in the same sori. Uredospores subhyaline or pale yellow, ovate, subglobose or ellipsoid, $25-32.5 \times 20-25 \mu$; epispore thin, $1-1.5 \mu$ thick, very minutely verruculose echinulate and with several (ca. 7) small, scattered germ pores.

Teleutospores amphigenous, on elliptic, greenish-yellow leaf spots, elongated lenticular, at first pale, becoming dark purplish-brown, long covered by the raised epidermis. Teleutospores subglobose, ellipsoid, oblong, obovate or cuneate, sometimes asymmetrical or somewhat angular, golden-brown to chestnut-brown, $28-42 \times 18-28 \mu$; apex usually rounded, occasionally truncate, very rarely conical; base attenuate or rounded; epispore smooth, ca. 2μ thick, not thickened at the apex. Pedicel persistent, slightly tinted yellowish-brown, especially at the apex, up to 35μ long; either $5-6 \mu$ broad at the apex and tapering gradually downwards, or about 9μ thick, attenuated suddenly below to 4 or 5μ .

on *Urginea exuvata* Steinh., leaves, Stellenbosch, Duthie (v. d. Byl 2479).

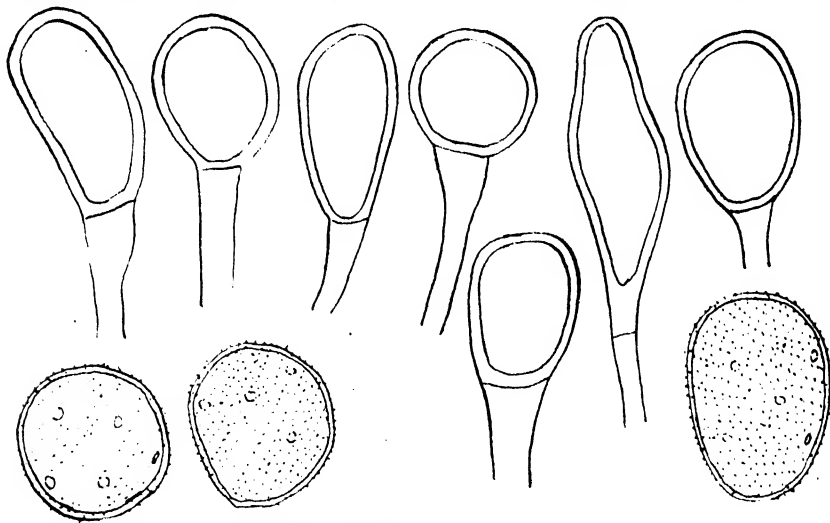


Fig. 15.—*Uromyces stellenbossiensis*. Uredo- and teleuto-spores.

The uredospores were not described by van der Byl. Of the other *Uromyces* spp. occurring on *Liliaceae* in South Africa, *U. stellenbossiensis* most closely resembles *U. Maireanus* Syd. on *Ornithogalum*; the teleutospores are similar in form to those of the latter species, but are slightly larger and the epispore thicker. Teleutospores of *U. Maireanus* are $20-34 \times 12-24 \mu$, with epispore 1.5μ thick. From *U. Bulbinis* Thuem. it differs in the scattered sori, which do not coalesce to form large groups and in the teleutospores which are darker brown, with thinner epispore not thickened at the apex.

***Uromyces Vignae* Barel.**

in Journ. Asiat. Soc. Bengal LX (1891) p. 211; Syd. Monogr. Ured. II (1910) p. 124.

?*Uromyces Dolichi* Cooke (" *Uromyces phaseolorum* forma ") in Grev. X (1882) p. 127.

?*Aecidium* sp., Hopkins, Trans. Rhod. Sc. Ass. 35 (1938) p. 105.

Nigredo Vignae (Barcl.) Fromme, Phytopath. XLV (1924) p. 72.

Uromyces Vignae-luteolae P. Henn., Ann. Mus. Congo II (1907) p. 95.

Spermogonia epiphyllous, in small circular groups, honey-yellow, becoming brownish, globose or flattened-globose, 100–125 μ diam.; ostiolar filaments short.

Aecidia chiefly hypophyllous and petiolicolous, in circular groups 2–4 mm. diam., often arranged in concentric rings, briefly cupulate, margin recurved, irregularly lacerate, 200–300 μ diam., Cells of the peridium rhomboid or oblong, slightly imbricated, 16–20 \times 20–25 μ , outer wall transversely striate, smooth, 3–5 μ thick, inner verrucose, 2–3 μ thick. Aecidiospores ellipsoid or oblong ellipsoid, 16–20 \times 20–29 μ ; wall colourless, 1–1.5 μ thick, closely and minutely verruculose.

Uredo-sori amphigenous and petiolicolous, scattered, round to irregular, up to 1 mm. diam., early naked, chestnut-brown, surrounded by the ruptured epidermis. Uredospores ellipsoid or ovate-ellipsoid, 24–30 \times 18–22 μ , wall cinnamon-brown, 1.5–2 μ thick, finely and closely echinulate; germ pores 2, conspicuous, markedly super-equatorial.

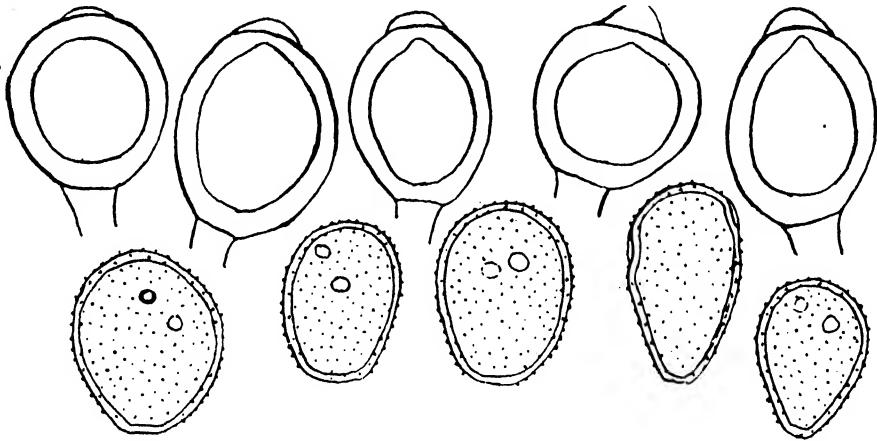


Fig. 16.—*Uromyces Vignae*. Teleuto- and uredo-spores.

Teleuto-sori amphigenous and petiolicolous, ca. 0.5 mm. diam., blackish-brown, early naked, somewhat pulverulent, surrounded by the ruptured epidermis. Teleutospores broadly ellipsoid, 27–35 \times 20–25 μ , rounded or broadly conical at the apex, usually rounded at the base; episore smooth, dark chestnut-brown, 2–2.5 μ thick, 4–6 μ thick at the apex, including the hyaline, hemi-spherical papilla. Pedicel hyaline, fragile, rarely equalling the spore in length.

on *Dolichos falciformis* E. Mey., Lemana, Doidge, 1827.

? *Dolichos gibbosus* Thunb., Somerset East, MacOwan; Durban, Medley Wood 40.

Dolichos lupiniflorus N.E.Br., Wellesley, S. Rhodesia, Hopkins, Rh. 2232; Mteptepa, Rh. 1849; Goromanzi, Rh. 4263.

Vigna stenophylla Burt Davy, Donkerpoort, Doidge and Bottomley, 30081.

Vigna unguiculata (Linn.) Walp., Nelspruit, Liebenberg, 26069; Cedara, Staples, 15432; Bathurst, Predy, 20426; Glendale, Rh. 1248, Kew.

Vigna sp., Wellesley, Rh. 2249, Rh. 2233; Rusapi, Rh. 4498.

Fromme (l.c.) pointed out that the rust on cowpea and related hosts is distinct from *Uromyces appendiculatus* on *Phaseolus* spp. The most distinct difference is the position of the germ pores in the uredospores; in *U. appendiculatus* they are two, equatorial and not easily seen; in *U. Vignae* their position is distinctly super-equatorial and they are readily distinguished. The teleutospores are similar, but those on cowpea have slightly

thinner walls and less apical thickening; they germinate immediately and those of the bean rust germinate only after a long ripening period. Drawings of spores of both species are reproduced for comparison.

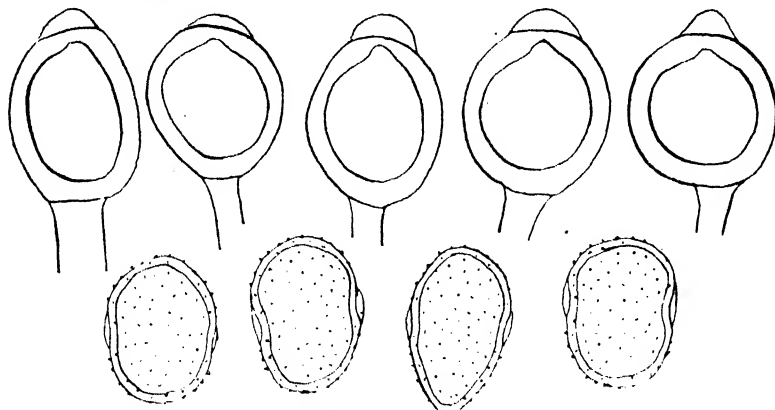


Fig. 17.--*Uromyces appendiculatus*. Teleuto- and uredo-spores.

These differences, with the exception of those observed in the germination of the teleuto-spores, for which fresh material would have been necessary, were found in the South African rusts on *Vigna* and *Dolichos*.

The aecidium (Rh. 2232, 2249, 1849) differs little from the diagnosis given by Fromme; Nos. Rh. 2232 and 2233 (Teleuto- and aecidia) were collected from separate plants growing within a few yards of each other. It seems probable that they are stages in the same rust. This aecidium seems to differ from *Aecidium Vignae* Cooke and has not been found in the Union.

I am indebted to Dr. Hopkins for the opportunity of examining the Rhodesian specimens quoted, and for material of several other Rhodesian rusts described in this paper.

***Uropyxis Gerstneri* Doidge nov. spec.**

Teleutosori plerumque hypophylli, pauci aggregati, deinde greges irregulares majores usque 5 mm. metientes formans, minuti, mox nudi et pulverulenti, epidermide lacerata cincti, atro-brunnei. Teleutosporeae castaneo-brunneae, oblongae, utrinque late rotundatae, haud incrassatae, septo verticali praeditae, medio vix constrictae, $25-32 \times 19-25 \mu$, episporio $1.5-2 \mu$ crasso, superficie aculeis subhyalinis v. brunneolis ad apicem 2-3 dentatis rarius simplicibus, $1.5-2 \mu$ interdum usque 4μ longis, densiuscule et irregulariter obsitis; poris germinationis binis in quoque loculo praeditis; pedicello leniter colorato persistenti, $25-60 \mu$ longo ad apicem $4-5 \mu$ crasso, inferne inflato, ca. 7.5μ crasso.

Hab. in foliis *Annonaceae* indet., False Bay, Zululand, leg. Gerstner, 34564.

Sori mostly hypophyllous, at first single or in small, close groups; later forming larger, more loosely connected, irregularly radiating groups up to 5 mm. diam. Single sori dark brown, minute, more or less circular in outline, 0.2-0.5 mm. diam., sometimes coalescing to form larger sori, surrounded by the torn epidermis, becoming loosely pulverulent. On the upper side of the leaf there is a depression in the leaf tissues above each sorus and thus are etched in the leaf surface irregularly radiating, branching lines; the leaf tissues are somewhat discoloured but there are no definite leaf spots. Occasionally a few sori develop on the upper side of the leaf, opposite those on the lower surface.

Teleutospores chestnut-brown, 2-celled, oblong, very broadly rounded at both ends, barely constricted at the septum, which is usually vertical, rarely oblique and only very occasionally transverse, rarely somewhat irregular in form and asymmetrical through

mutual pressure, $25-32 \times 19-25 \mu$, mostly $25 \times 20 \mu$. Epispore $1.5-2 \mu$ thick, rather uneven in thickness but not thickened at the apex, bearing numerous aculeae, irregularly placed, but usually more numerous on the side remote from the pedicel. Aculeae hyaline or slightly tinted, $2-2.5 \mu$ or occasionally up to 4μ long, sometimes tapering from a base about 1μ broad to a simple, obtuse apex; most frequently 2-3 dentate at the apex, or with spreading branches up to 1μ long. Germ pores 2 in each cell. Pedicel slightly tinted, $25-60 \mu$ long; upper portion smooth, thick-walled, $4-5 \mu$ thick, the lower part inflated and somewhat club-shaped, ca. 7.5μ thick, rough, tuberculate.

on leaves of *Annonaceae* undet., False Bay, Zululand, *Gerstner* 4817, 34564.

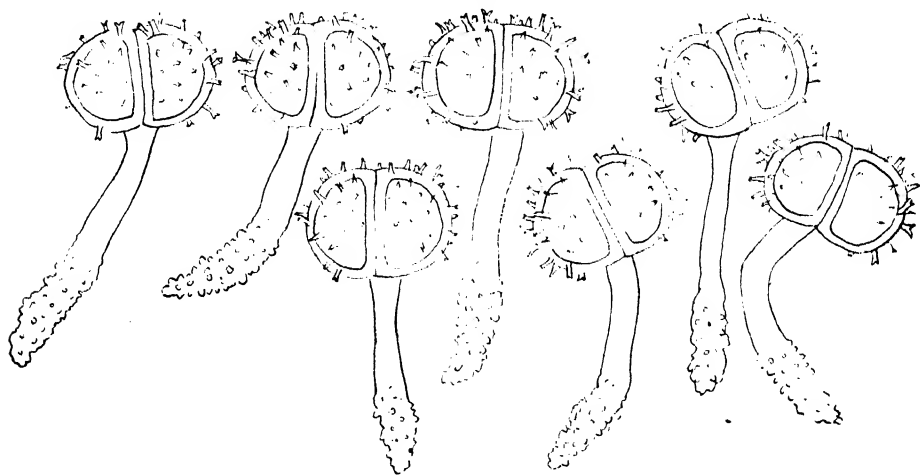


Fig. 18.—*Uropyxis Gerstneri*. Teleutospores.

***Uropyxis Steudneri* P. Magn.**

Ber. Deutsch. Bot. Ges. X (1892) p. 193 and XVII (1899) p. 119.

Dietel in Engl. and Prantl, Die natürlich. Pflanzenfam., 2 Aufl. (1928) Bd. 6, p. 65.

Diorchidium Steudneri P. Magnus, Ber. Deutsch. Bot. Ges. IX (1891) p. 91. Taf. V.

Puccinia Steudneri (P. Magn.) Dietel, Prings. Jahrb. XXVI (1894) p. 81, Taf. XIV,

Fig. 2. Syd. Monogr. Ured. 1 (1904) p. 841, Tab. XLIV, F. 562.

Var. *rhodesica* Doidge nov. var.

A typo differt teleutosporis majoribus, $50-65 \times 37.5-45 \mu$, septo plerumque horizontali et tegumento pallide fusco.

Hab. in foliis petiolisque *Ormocarpum trichocarpi*, Inyati, leg. Hopkins (Rh. 5990)

Spermogonia epiphyllous, opposite the hypophyllous teleuto-sori, in small groups, sometimes surrounded by teleuto-sori, honey-yellow, lenticular, ca. $150-200 \mu$ diam.

Teleuto-sori amphigenous and petiocolous, but most frequent and extensive on the lower surface of the leaf; from about 0.5 mm. diam., varying in size and often covering the whole under surface of the leaflet, up to 3×1.5 mm., or on petioles becoming elongated up to 3 mm. long and 0.5 mm. broad, dark brown, firm, pulvinate, early becoming naked, surrounded by the torn epidermis. Teleutospores broadly elliptical, broadly rounded at both ends, not constricted at the septum, $50-65 \times 37.5-45 \mu$ (when dry, $45-60 \times 30-37.5 \mu$). Wall laminate, minutely or rather distinctly verrucose; verrucae ca. $1-1.5 \mu$ long, obtusely conical and irregularly placed, about $3-5 \mu$ distant from one another; inner layer chestnut-brown, $2.5-4 \mu$ thick, outer pale fuscous, swelling when wet to a thickness of $4-7.5 \mu$, but mostly 5μ thick; septum horizontal (ca. 50 per cent.), oblique (ca. 36 per cent.) or vertical

(ca. 14 per cent.); germ pores lateral, two in each cell. Pedicel persistent, up to $180\ \mu$ long, hyaline, $6-9\ \mu$ broad; at first cylindrical throughout, when spores are mature, swelling just below the spore into a globose vesicle $20-25\ \mu$ diam.; this bursts in water, setting free the spore.

on leaflets and petiole of *Ormocarpum trichocarpum* (Taub.) Harms, Inyati, S. Rhodesia June 1943, J. C. Hopkins (Rh. 5990).

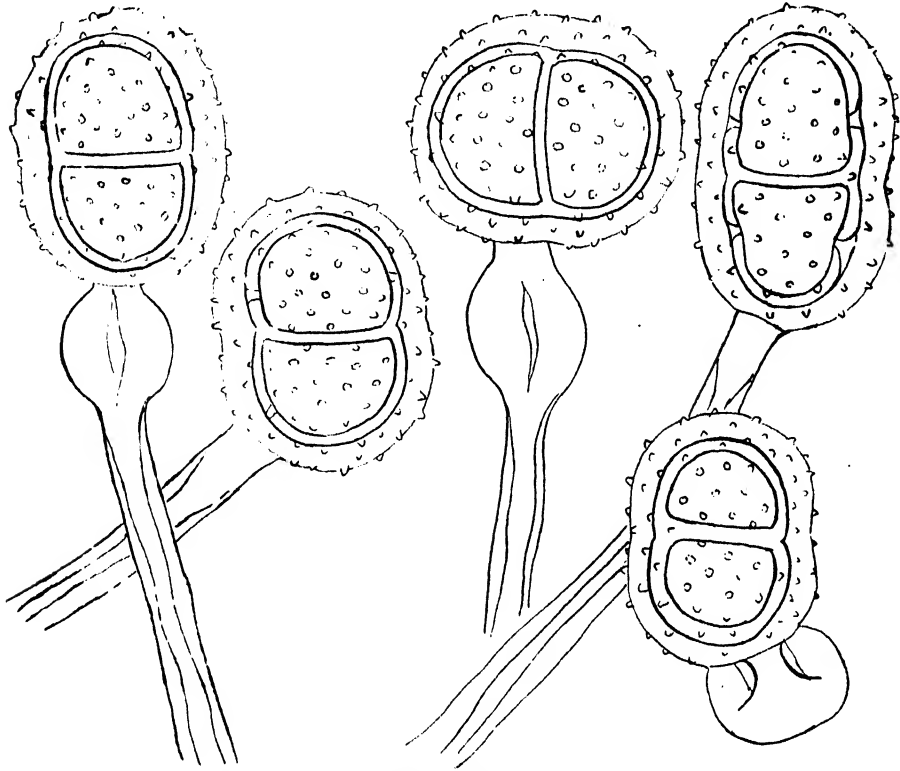


Fig. 19.—*Uropyxis Steudneri* var. *rhodesica*. Teleutospores.

The type was described by Magnus (1891 l.c.) as *Diorchidium Steudneri* on *Ormocarpum bibrachiatum* Bkr. from Abyssinia; later he transferred this rust to the genus *Uropyxis*. He gave the average measurements of the teleutospores as $44.4 \times 36\ \mu$; *vide* Sydow l.c., the limits of size are $40-52 \times 35-40\ \mu$. In the type the septum is usually vertical as in the genus *Diorchidium* and the outer envelope of the spore hyaline.

The variety differs in the consistently larger spores, predominantly horizontal or oblique septum and pale, fuscous outer envelope.

SOUTH AFRICAN RUST FUNGI.

By E. M. Doidge.

Part VI.

THE SPECIES OF UROMYCES ON IRIDACEAE.

In Sydow's *Monographia Uredinearum* (Vol. II, 1910, p. 251), it is stated that of the 18 species of *Uromyces* known to occur in genera of the family Iridaceae, only one occurs in Europe, two in America and the remaining 15 species in Central and South Africa. The African species are closely related to one another, differing only in a number of small points such as the presence or absence of paraphyses in the sori, the size of the uredospores and the form and colour of the teleutospores, including the thickness of the wall, which is usually more or less thickened at the apex.

Fourteen of the 15 African species mentioned in the Monograph were recorded from South Africa, and since 1910, five more species have been described on hosts belonging to the Iridaceae in this country.

Several of the earlier species were described from a single collection and often from sparse material. When abundant material is available, some of the minor differences regarded as specific distinctions are found to fall away, as the spore characters are more variable than at first supposed. For example, *Uromyces Melasphaerulae* Syd. is said to be distinguished by its regularly spherical teleutospores; actually the teleutospores, although predominantly globose, vary considerably in form and may also be oblong or ovate with bluntly conical or truncate apices.

There has also been a tendency to describe as new, rusts found on host genera on which no species of *Uromyces* had been recorded. An imperfect knowledge of the nomenclature of South African plants has then led to a further multiplication of species. *Uromyces Zeyheri* Bubak is described on *Ixia scillaris*; this is the same plant as *Tritonia scillaris*, the host of the type of *Uromyces bona-spei*. There is no significant difference in the descriptions of the two *Uromyces* species.

It is evident that a critical comparative study of the South African species of *Uromyces* occurring in Iridaceae is desirable, now that more extensive collections have been made. In the Cryptogamic Herbarium, Pretoria, there is abundant material of several species, and I am indebted to the Director of the South African Museum, Cape Town, and to my colleagues in the phanerogamic section of the National Herbarium, Pretoria, for allowing me to examine a number of specimens on which rust pustules were found.

In studying this group of *Uromyces* species, it has been found that the form of the sorus is characteristic. The presence or absence of paraphyses and the depth of the sorus, including the number of rows in which the spores are arranged, are remarkably constant characters; they are of considerable diagnostic value, in view of the very slight variations in the size and form of the spores.

No fresh collections have been made of *Uromyces Sparaxidis* Syd. [Ann. Myc. 2 (1904) p. 27 and Monogr. Ured. II (1910) p. 257] which was described from material collected by Medley Wood in Natal; the collector's number is not quoted. In *Bothalia* II (1927) p. 31, a rust on *Dierama pendulum* (= *Sparaxis pendula*) collected by Medley Wood, was assigned to this species; so far as can be judged by the description of the spore characters, this is incorrect; it is not stated whether paraphyses are present in the teleuto-sori or not. There is also some doubt about the identity of the host plant. The type is said to be on *Sparaxis lineata* collected in Natal by Medley Wood. *Sp. lineata* is a plant occurring only in the winter rainfall area of the Cape and is not found in Natal. No authentic material of the species has been available for study, it has therefore not been possible to include it in the key, or to compare it with other South African species.

The remaining 18 species have been studied, and it is considered that only 10 can be regarded as distinct species; these have been re-described and figured. A further two species have been described.

KEY TO THE SPECIES.

A.—No paraphyses in the teleuto-sori.

(a) Teleutospores not thickened at the apex or only slightly so (up to $4\ \mu$)... 1. *U. Moraeae*.

(b) Teleutospores thickened at the apex (4 – $10\ \mu$).

1. Teleuto-sori long remaining covered, shallow, not more than $100\ \mu$ deep, spores in ca. 3 rows.

x. Uredospore 16 – 25×15 – $19\ \mu$, wall $1\ \mu$ thick..... 2. *U. Eclonii*.

xx. Uredospore 20 – 27×20 – $24\ \mu$, wall $2\ \mu$ thick..... 3. *U. Zeyheri*.

xxx. Uredospore 17 – 24×15 – $20\ \mu$, wall 2 – 5 – $3\ \mu$ thick..... 4. *U. Iziae*.

2. Teleuto-sori becoming naked comparatively early, sori compact, pulvinate, 100 – $150\ \mu$ deep, spores in 5 – 7 rows..... 5. *U. Gladioli*.

B.—Individual teleuto-sori surrounded by paraphyses.

(a) Paraphyses very freely developed and often continuous and palisade-like between distant sori..... 6. *U. kentaniensis*.

(b) Paraphyses less numerous, usually restricted to a palisade-like envelope round each individual sorus.

1. Teleuto-sori 100 – $125\ \mu$ deep, spores in five closely packed rows..... 7. *U. Dieramae*.

2. Teleuto-sori 60 – $80\ \mu$ deep, spores in 3 – 4 rows.

x. Aecidia present.

y. Uredospores 25 – 30×19 – 22 – $5\ \mu$, wall 2 – 2 – $5\ \mu$ thick..... 8. *U. Ferrariae*.

yy. Uredospores 20 – 24×13 – $20\ \mu$, wall 1 – 5 – 1 – $7\ \mu$ thick..... 9. *U. Anomathecae*

xx. Aecidia not present.

y. Uredospore with wall ca. $2\ \mu$ thick, finely but conspicuously verruculose-echinulate..... 10. *U. Antholyae*.

yy. Uredospore with wall 1 – $5\ \mu$ thick, closely and very minutely verruculose.

o. Wall of teleutospore ca. 2 – 2 – $5\ \mu$ thick, apex thickened 5 – $9\ \mu$; spore 17 – $20\ \mu$ broad..... 11. *U. Freesiaae*.

oo. Wall of teleutospore ca. $2\ \mu$ thick, apex thickened 4 – $6\ \mu$, rarely more; spore 15 – 17 – $5\ \mu$ broad..... 12. *U. transversalisae*.

1. *Uromyces Moraeae* Syd.

Sydow, Ann. Myc. X (1912) p. 33, Doidge, Bothalia II (1927) p. 36.

II. Uredo-sori scattered, or numerous and crowded, but rarely confluent, oblong, lying between the veins of the leaf, $\frac{1}{4}$ – $1\ \text{mm.}$ long, ca. $\frac{1}{2}\ \text{mm.}$ broad, at first blister-like, covered by the raised epidermis; the epidermis soon ruptures, revealing the pale yellow-brown spore masses, which are surrounded or partially veiled by the torn epidermis. Uredospores globose or subglobose to ovate, 21 – 25×20 – 22 – $5\ \mu$, rarely oblong and up to $32\ \mu$ long; epispore thin, delicate, pale golden-brown to subhyaline, 1 – 1 – $25\ \mu$ thick, very finely and rather closely verruculose echinulate; germ pores 6 – 8 , scattered, small but obvious.

III. Teleuto-sori similar to the uredo-sori but darker. Sorus shallow, the teleutospores usually developing in not more than three rows, usually becoming exposed rather early, subpulverulent; no paraphyses. Teleutospores deep chestnut-brown, globose, subglobose, oblong or ovate, rarely irregular in form; rounded at the apex; rounded at

the base, or, less frequently, tapering somewhat to the pedicel; mostly $22-25 \times 17-24 \mu$ ($18-28 \times 16-24$ *fide* Sydow); epispore smooth, $2-2.5 \mu$ thick, not thickened at the apex or slightly thickened ($2.5-4 \mu$); pedicel rather stout, hyaline except at the apex, where it is slightly tinted, persistent, ca. 6μ thick and up to 50μ long.

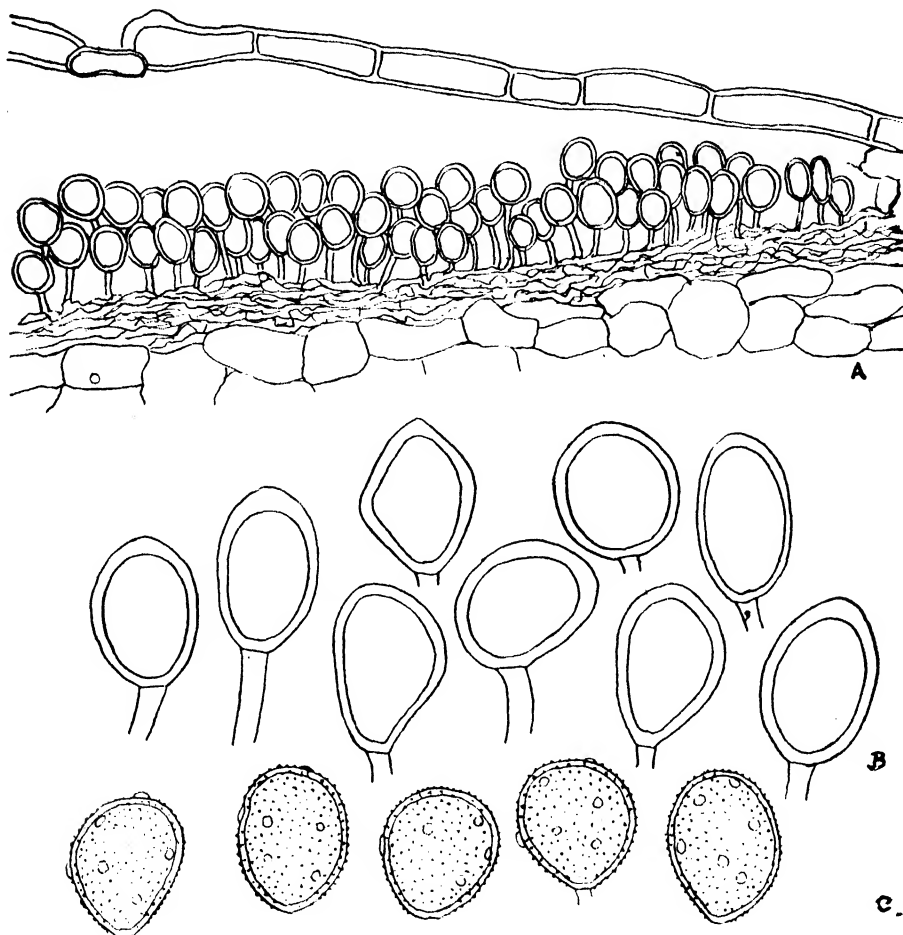


Fig. 1.—*Uromyces Moraeae* Syd.
(a) Section through telentosorus.
(b) Teliospores.
(c) Uredospores.

n *Moraea spatulata* Klatt., Volksrust, *Weeber*, 773 (Co-type); Melmoth, *Foster*, 11630; Mooi River, *Mogg*, 17036; Hopevale, nr. Donnybrook, *Doidge*, 33438.

2 *Uromyces Ecklonii* Bubak.

in Sydow, Monogr. Ured. II (1910) p. 253. Doidge, Bothalia II (1927) p. 32.

II. Uredo-sori amphigenous, lying between the veins of the leaf, round to irregular or transversely oblong, up to ca. 0.6 mm. diam., or becoming confluent and larger, early naked, yellow, pulverulent, surrounded by the torn epidermis, which splits longitudinally.

Uredospores ovate or subglobose, pale yellow to subhyaline, $16-25 \times 15-19 \mu$; epis pore 1μ thick, minutely and rather closely verruculose-echinulate; germ pores 6-9, small, obscure.

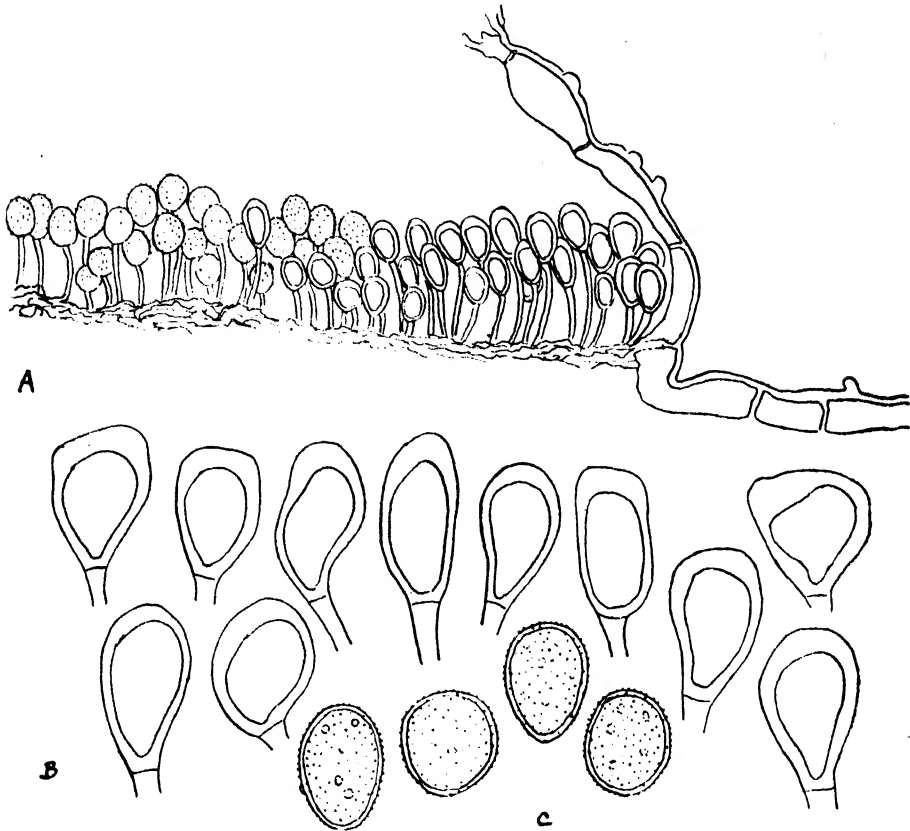


Fig. 2.—*Uromyces Ecklonii* Bubak.
(a) Section through sorus.
(b) Teleutospores.
(c) Uredospores.

III. Teleuto-sori minute, scattered, often interspersed with the uredo-sori, dark brown, round to irregular, up to ca. 0.3 mm. diam., compact, long covered by the epidermis; teleutospores often forming at the margin of a uredo-sorus; sori shallow, spores in not more than three rows. Teleutospores ovate to subglobose, or somewhat irregular and angular through mutual pressure, brown, apex usually rounded, less frequently truncate or obtusely conical, base more or less attenuate, less frequently rounded, $20-32 \times 15-20 \mu$; epis pore smooth, $2-2.5 \mu$ thick, slightly thickened ($4-8 \mu$) at the apex. Pedicel persistent, hyaline except at the apex, where it is slightly tinted, ca. 5μ broad, up to 40μ long.

on *Freesia* sp., Prospect, nr. Komgha, Pegler, 5129; Thornville Junction, Natal, Slatter, 23186.

Uromyces Ecklonii was originally described by Bubak on *Freesia odorata*, collected at the Cape by Ecklon and Zeyher. The type has not been available for study, but the collections quoted agree well with the original description. The genus *Freesia* has been revised, and the species of the host plants are not determinable without flowering material; the generic identification, however, presents no difficulty.

3. *Uromyces Zeyheri* Bubak.

in Sydow, Monogr. Ured. II (1910) p. 255; Doidge, Bothalia II (1927) p. 255.

Uromyces Bona-spei Bubak in Syd. Monogr. Ured. II (1910); Doidge, Bothalia II (1910) p. 37.

II. Uredo-sori amphigenous, scattered or in groups, round to irregular, often in transversely oblong groups and becoming confluent; the epidermis ruptures irregularly and exposes the yellow, pulverulent spore masses; uredospores are sometimes also found in the teleuto-sori. Uredospores globose, subglobose, ovate or oblong, yellow, $20-27 \times 18-24 \mu$; epispore ca. 2μ thick, very briefly echinulate, with 6-8 scattered germ pores.

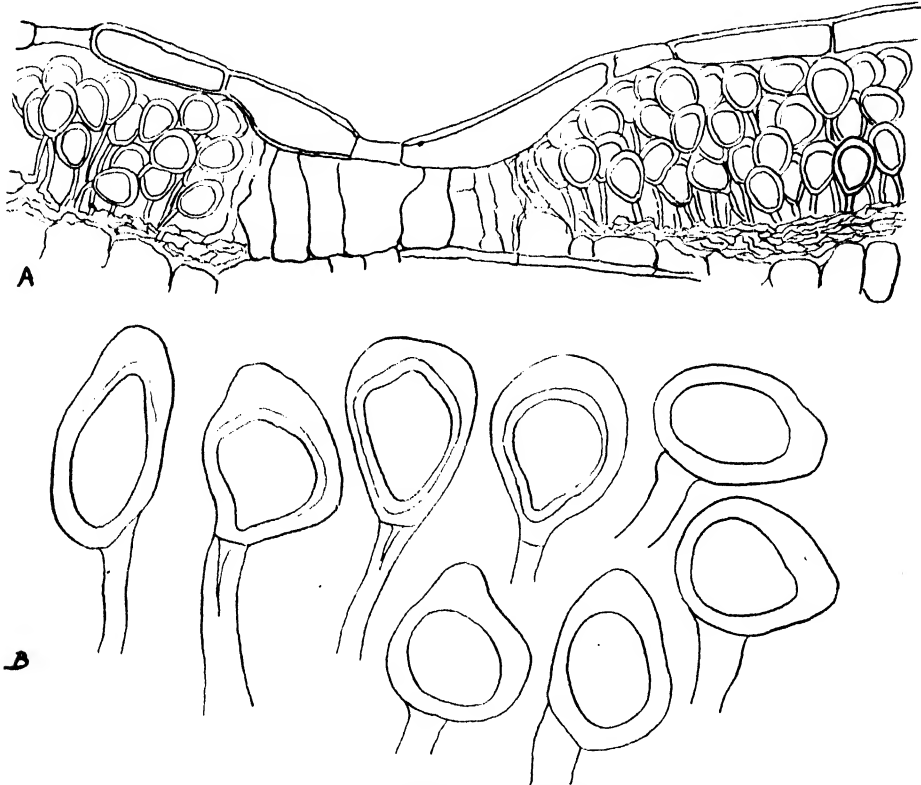


Fig. 3—*Uromyces Zeyheri* Bubak.
(a) Section through teleutosorus.
(b) Teleutospores.

III. Teleuto-sori amphigenous, minute, more or less circular in outline, $100-300 \mu$ diam., scattered or confluent in oblong, transverse groups, dark brown, compact, long covered by the epidermis, developing under a stoma, $75-100 \mu$ deep; spores closely packed in ca. 3 rows; no paraphyses. Teleutospores globose, ovate or ellipsoid, often irregular and asymmetrical through mutual pressure; apex rounded, conical or truncate, sometimes oblique; base usually rounded, or less frequently tapering somewhat; $24-37.5 \times 20-27 \mu$, mostly $30-35 \times 22-24 \mu$; epispore deep chestnut-brown, smooth, $3-4 \mu$ thick, rarely 2.5μ , thickened at the apex ($5-10 \mu$); pedicel persistent, tinted brown, especially near the apex, rather stout, $5-7 \mu$ broad and up to 90μ long.

on *Tritonia scillaris* Bkr. (= *Ixia scillaris*) Houwhoekberg, Cape, Schlechter 9411 (part of type collection of *U. Zeyheri*) 33296.

Uromyces Zeyheri was described by Bubak as occurring on *Ixia scillaris*, which is the same plant as *Tritonia scillaris*, the type host of *U. Bona-spei*. There is no significant difference in the descriptions of the two species and I think there can be no doubt that they are identical. In the case of *U. Bona-spei* neither locality nor collector is mentioned.

Sydow also mentions *Acidanthera pallida* as a host of the latter species; *Acidanthera pallida* (Ker.) Pax is mentioned as an African plant in Engler and Prantl, *Naturl. Pflanzenfam.* II. 5 (1887) p. 155; the name is not to be found in any other publication on tropical or South African plants which is available, and it is not known to what plant this name refers.

4. *Uromyces Ixiae* (Lev.) Wint.

Winter in Flora 58 (1884) p. 262; Sydow, *Monogr. Ured.* II (1910) p. 255; Doidge *Bothalia* II (1927) p. 34.

?*Uredo Ixiae* Rud., *Linnaea* 4 (1829) p. 387.

?*Uredo Ixiae* Lev., *Ann. Sc. Nat.*, III Ser., tome 3 (1845), p. 70.

Uromyces Melasphaerulae Syd., *Ann. Myc.* II (1904) p. 28; Syd. *Monogr. Ured.* II (1910) p. 256; Doidge, *Bothalia* II (1927) p. 35.

Uromyces delagoensis Bubak, in Syd. *Monogr. Ured.* II (1910) p. 255; Doidge *Bothalia* II (1927) p. 35.

II. Uredo-sori amphigenous, scattered or in groups, minute, round or oblong, yellow or yellow-brown; covered at first by the blistered epidermis which ruptures, and remains partly veiling the sorus. The leaf tissues may be discoloured in the region of the sori, or rather indefinite, round to irregular brown leaf spots may be formed (especially on *Melasmaerula*). Uredo-pores yellow or yellow-brown, usually pale, globose or ovate, $18-24 \times 17-22 \mu$; epispore $2.5-3 \mu$ thick, rarely up to 3.5μ , minutely and closely verruculose; germ pores 6-8, minute, scattered.

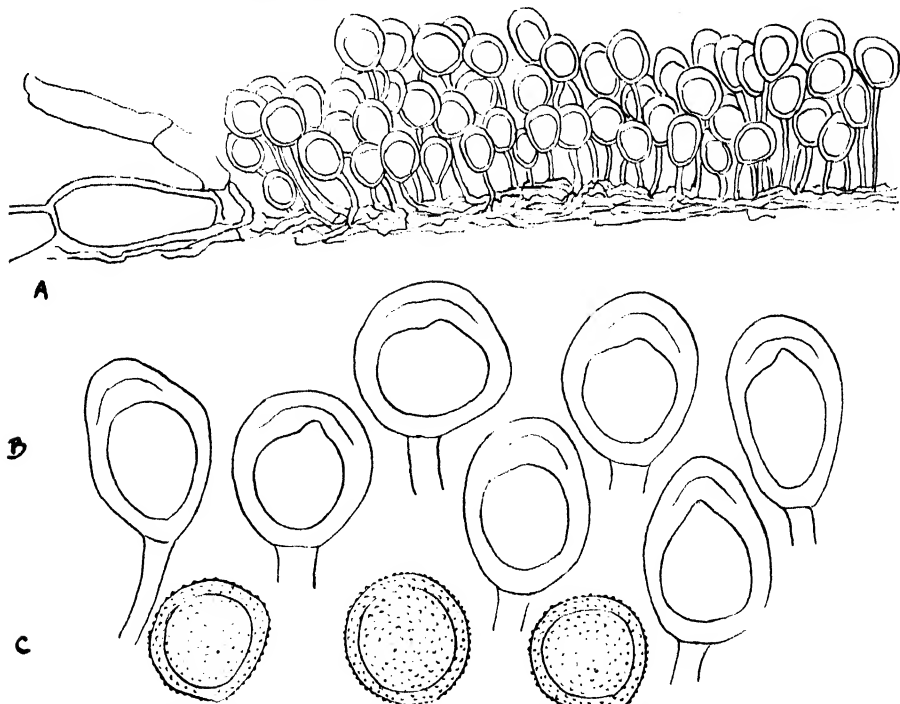


Fig. 4—*Uromyces Ixiae* (Lev.) Wint., on *Lapeyrouisia corymbosa*
(a) Section through teleutosorus.
(b) Teleutospores.
(c) Uredospores.

III. Teleuto-sori scattered, or crowded and becoming confluent, more or less round but angular, or oblong, lying between the veins, long covered by the epidermis. Sori comparatively shallow, usually ca. $75\ \mu$ deep, rarely up to $100\ \mu$; formed of about three rows of closely packed spores; no paraphyses. Teleutospores chestnut-brown, globose, oblong or ovate, rarely ellipsoid, sometimes slightly angular and irregular through mutual pressure; usually rounded at the apex, less frequently obtusely conical or truncate; base rounded or somewhat attenuate; $22.5\text{--}35\ \mu$, rarely up to $40\ \mu$ long, $17.5\text{--}30\ \mu$ broad, mostly $30\text{--}35 \times 20\text{--}25\ \mu$; epispore smooth, mostly $2.5\text{--}3\ \mu$ thick, less frequently up to $3.5\ \mu$, thickened at the apex, $5\text{--}10\ \mu$, rarely up to $12.5\ \mu$; pedicel rather stout, persistent, usually $6\text{--}7\ \mu$ thick (up to $9\ \mu$ *vide* Winter) and $60\ \mu$ long, tinted brown throughout or near the apex.

on *Ixia furcata* Ker., Bokkeveld, Marloth 7659, 33302.

Ixia leucantha Jacq., St. James, Pole Evans, 7736.

Ixia lutea Bkr., Drakenstein Mts., Galpin 12281, 33306.

Ixia maculata Thunb., nr. Hopefield, Cape, Letty, 33305.

Ixia paniculata Del., Caledon, Marloth 5939, 33304.

Ixia patens Ait., Genadendal, Roser, 33309.

Ixia scariosa v. *longifolia* Bkr., Bokkeveld, Marloth 13341, 33303.

Ixia splendida Lewis, nr. Zebrakop, Piquetberg, Pillans 7183, 33307.

Lapeyrousia corymbosa Ker., without locality, Zeyher 1594, 33320.

Lapeyrousia delagoensis Bkr., Tolana Beach, Delagoa Bay, Thóäy 169, 33321.

Melasmaerula graminea Ker., Table Mt., Ecklon, 33301; Bredasdorp, C. A. Smith, 33308.

Sparaxis bulbifera Ker., Bloemendal, Zeyher 3968, 33319.

The first mention of a rust on *Ixia* is in Linnæa 4 (1829) p. 387, where *Uredo Ixiæ* is described by Rudolphi on leaves of *Ixia conica* Salisb. (= *Ixia maculata* Thunb.) from the Cape. "Caeoma maculis subnullis; acervis amphigenis rotundis epidermide rumpente; sporidiis ovatis, medio punctatis, nigris, demum fuscis pedicellatis."

In 1845, Lévêillé (Champignons Exotique, in Ann. Sc. Nat. III Sér. t. 3, p. 70) described a rust on *Ixia* sp. as follows:—

"331. *Uredo Ixiæ* nov. sp. Amphigena, acervulis gregariis oblongis nigris epidermide tectis, sporangiis globoso-ellipticis glabris obtusis pedicellis longiusculis. —Hab. ad Cap. Bon. Sp. in foliis *Ixiæ* . . . Drège n. 8369.

"Les petites pustules que forme cette espèce sont allongées, parallèles aux fibres des feuilles, et recouvertes presque constamment par l'épiderme; leur couleur est noire; les sporange, à peu près elliptiques, glabres, et supportés par un pédicelle aussi long qu'eux, ressemblent à ceux de l'*Uredo Iridis*; mais dans ce dernier ils sont jaunes."

Winter (Flora 1884, p. 262) drew attention to the fact that according to Lévêillé's description *Uredo Ixiæ* was a *Uromyces* sp., and considered it identical with a rust on *Ixia* which he had examined. *Uromyces Ixiæ* Wint. was described from a rust on *Lapeyrousia corymbosa* and Winter stated that the same fungus occurred on *Ixia* and on *Sparaxis grandiflora*.

Sydow (Monogr. Ured. II 1910, p. 255) does not mention *Lapeyrousia corymbosa*, the type host, but quotes as hosts *Sparaxis grandiflora*, *Acidanthera exscapa* [= *Engysiphon exscapus* (Thunb.) Lewis] and several species of *Ixia*. Of the latter, *Ixia coerulescens* is now known as *Babiana villosa* Ker. and Gaul; the rust on the *Babiana* spp. examined in the course of this study was not *Uromyces Ixiæ*. The identity of the *Ixia erecta* mentioned by Sydow is not certain, as the name of the author is not given; *Ixia erecta* Jacq. is *I. lutea* Bkr. and *I. erecta* Berg is *I. polystachya* L.

Uromyces delagoensis Bubak was described on *Lapeyrousia delagoensis* from Mozambique; the description of this species does not differ materially from that of *U. Ixiæ*, except in

the thickness of the wall of the uredospore (*vide* Sydow 3–3.5 μ in *U. Ixiae*, 2–2.5 μ in *U. delagoensis* and *U. Melasphaerulae*); actually it varies in thickness, even in the same spore; it is usually 2.5–3 μ thick and occasionally up to 3.5 μ . The rusts on *Lapeyrouisia delagoensis* and *Melasphaerula graminea* examined cannot be distinguished from *Uromyces Ixiae*.

Sydow (l.c.) suggests that *U. delagoensis* may be the same as *U. Anomathecae* but he had not seen Medley Wood's collection of this fungus, which has paraphyses in the teleutosori. According to Sydow, *U. Melasphaerulae* is characterised by spherical teleutospores; in material examined, a considerable proportion of globose spores was seen, but oblong and ovate forms were also present and spores with bluntly conical or truncate apices.

5. *Uromyces Gladioli* P. Henn.

Hedwigia 34 (1895) p. 326; Sydow, Monogr. Ured. II (1910) p. 254; Doidge, Bothalia II (1927) p. 33.

? as *Puccinia Gladioli* Cast. (Fungus stylosporiferus *Uredo Gladioli* Req.) f. *Gladioli Ecklonii* von Thumen, Flora (1875) p. 379.

Uromyces Geissorrhizae F. Henn., Hedwigia 39 (1900) p. (153); Syd. Monogr. Ured. II (1910) p. 253; Doidge, Bothalia II (1927) p. 32.

Uromyces Babianae Doidge, Bothalia II (1927) p. 31.

Uromyces Romouleae v. d. Byl and Werd., Rep. spec. nov. regni veg. 19 (1923) p. 54.

Uromyces Romuleae Doidge, Bothalia II (1927) p. 31.

II. Uredo-sori irregularly round to oblong, scattered between the veins of the leaf, up to 0.5 mm. long, but often in series, becoming confluent, and forming longer striae; at first covered by the white, blistered epidermis which early ruptures longitudinally, exposing yellow, pulverulent spore masses. Uredospores globose to ovate, pale golden-brown to subhyaline, $20\text{--}25 \times 17.5\text{--}24 \mu$; epispore uneven in thickness, 2–3.5 μ thick (mostly 2–3 μ), finely and rather closely verruculose echinulate and with 6–9, small, obscure, scattered germ pores.

III. Teleuto-sori amphigenous, elliptic or oblong, scattered or in series between the veins of the leaf, up to 1 mm. long, or confluent and forming striae up to 2 mm. long; at first covered by the lead-coloured epidermis, which splits longitudinally rather early, revealing the dark brown spore masses. Sorus without paraphyses, compact, pulvinate, 100–150 μ deep and consisting of 5–7 or even 8 rows of closely packed spores. Teleutospores dark chestnut brown, subglobose, ovate, rarely ellipsoid, or angular and irregular through mutual pressure; apex mostly rounded, but sometimes truncate or broadly conical; base usually rounded; $22.5\text{--}35 \times 20\text{--}25 \mu$, rarely up to 40 μ long, mostly $25\text{--}30 \times 20\text{--}22.5 \mu$; epispore smooth, 2.5–3.5 μ or rarely 4 μ thick, thickened at the apex, 6–7.5 μ , less frequently up to 9 μ ; the epispore is more or less distinctly lamellate and there is some indication of an apical pore; pedicel stout, persistent, tinted brown, especially near the apex, 5–7 μ broad and up to 75 μ long, occasionally inserted somewhat obliquely.

on *Babiana disticha* Ker., Retreat, Pole Evans, 12959 and Kew (type collection of *U. Babianae*).

Babiana stricta Ker., Cold Bokkeveld, Marloth, 21014.

Geissorrhiza secunda Ker., Vogelgat, western Cape, Schlechter 9577, 33300 (part of type collection of *U. Geissorrhizae*).

Gladiolus crassifolius Bkr., Ugie, Cape, Joubert, 25317.

Gladiolus cuspidatus Jacq., Diep River, Cape, Marloth, 9304; Kenilworth, Bolus, 8466.

?*Gladiolus Ecklonii* Lehm., Bazuja, Kaffraria, Baur.

Gladiolus formosus Klatt., Bokkeveld, Marloth 7561, 10032.

Gladiolus hirsutus Jacq., Picquetherg, Cape, Marloth, 21031.

Gladiolus recurvus L., Kentani, Pegler 1958, 8412; Albertina, Muir, 8867.

Gladiolus spp., Durban, v. d. Byl, 9176; Capetown, 543; Cramond, Pole Evans, 6851; Mooi River, Mogg, 17037.

Romulea rosea Ecklon, Klappmuts, v. d. Byl 494, 10094, 32447 (part of the type collection of *U. Romouleae*).

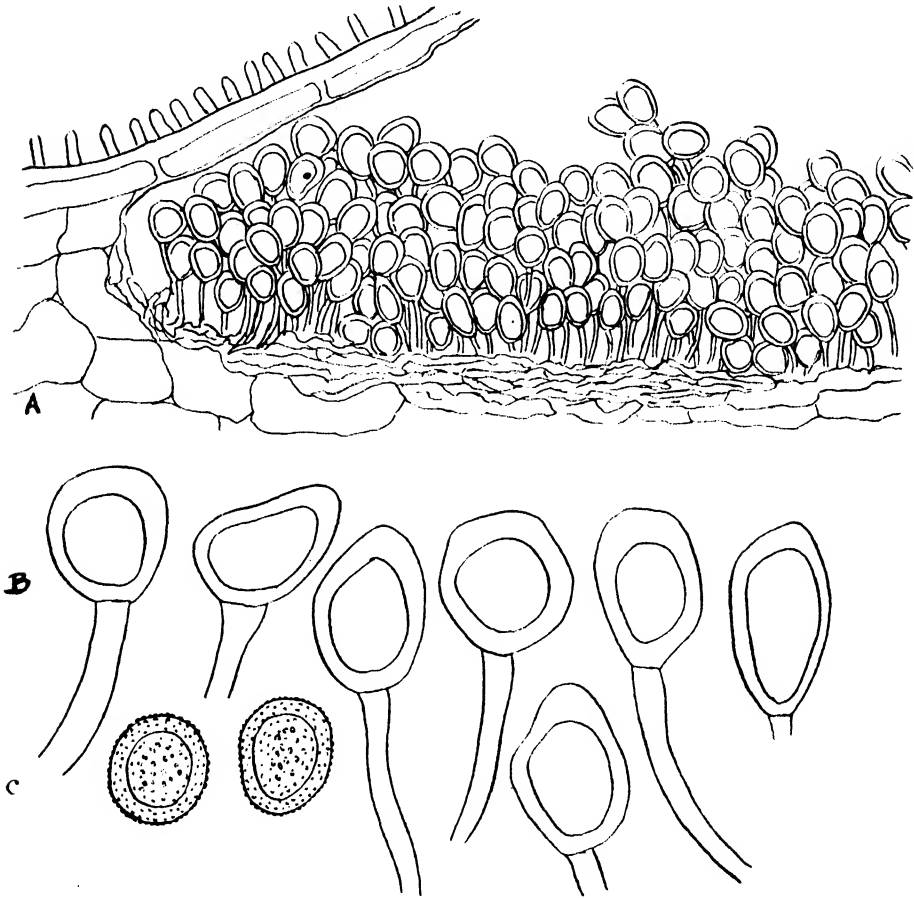


Fig. 5.—*Uromyces Gladioli* P. Henn.

(a) Section through teleutosorus.

(b) Teleutospores.

(c) Uredospores.

Uromyces Gladioli was originally described by Hennings (l.c.) on leaves of *Gladiolus angustus* L., collected by Leibold at the Cape. This specimen has not been seen, but, from the description there can be little doubt that this is the rust studied on the several *Gladiolus* spp. enumerated. It is also recorded by Sydow (l.c.) on *Gladiolus blandus* Ait. and *G. orchidiflorus* Andr. from South Africa and *G. Quartinianus* from Kilimandscharo, in tropical Africa.

It seems probable that the rust on *Gladiolus Ecklonii* Lehm. mentioned by von Thümen (l.c.), uredo only, is this species; unfortunately no description is given and this specimen

has not been seen. It seems unlikely that it is *Uromyces transversalis* with which von Thümen was familiar.

Uromyces Geissorrhizae P. Henn. was described on leaves of *Geissorrhiza* sp. collected at Vogelgat in the western Cape, Schlechter 9577; sori were found on this collection in the phanerogamic herbarium and were studied; in every particular the sori and spores resemble those of *Uromyces Gladioli*. Type collections of *U. Babianae* Doidge and *U. Romoulea* v. d. Byl were also studied and these rusts found to be identical with *U. Gladioli*.

Sydow has recorded the occurrence of *U. Geissorrhizae* on *Geissorrhiza rupestris* Schlecht. and *G. secunda* (Berg.) Ker. and also on *Moraea ramosa* Ker. The only *Uromyces* sp. on *Moraea* in the material studied is *Uromyces Moraeae* on *Moraea spathulata*; no locality or collector is mentioned by Sydow in connection with the fungus on *Moraea ramosa*, and no rust on this host could be traced.

Uromyces Gladioli occurs on a wide range of hosts, many of which are restricted to the south-western Cape and to the coastal area of the eastern Cape and Natal. Nearly all the localities in which it has been found are within 75 miles of the coast, the only exception being Ugie in the Maclear district, which is about 85 miles inland. In collection No. 17037 on *Gladiolus* from Mooi River, Natal, *U. Gladioli* was found in close association with *U. transversalis*; sori of both species were found in close proximity on the same leaves.

6. *Uromyces kentaniensis* Doidge.

Doidge, Bothalia II (1927) p. 30.

II. Uredo-sori hypophyllous, on rather indefinite, greenish or brownish leaf spots, not numerous, widely scattered, solitary or in small groups of 2-4, rarely more, round or oval, up to $\frac{1}{4}$ mm. diam., surrounded by the torn epidermis. Uredospores ovate or sub-

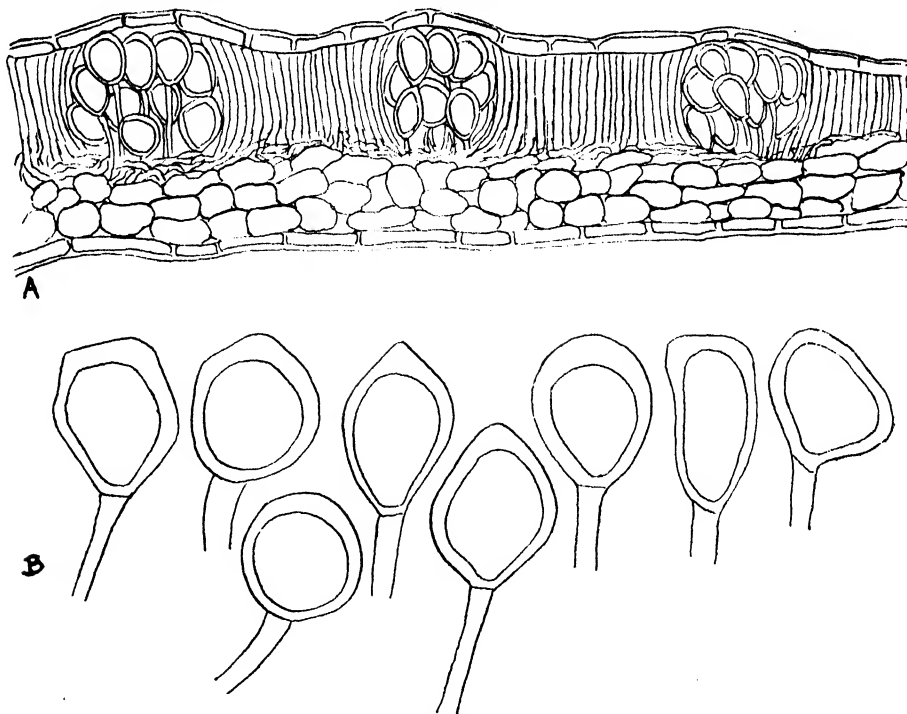


Fig. 6—*Uromyces kentaniensis* Doidge.
(a) Section through teleutosorus.
(b) Teleutospores.

globose, $19-28 \times 17.5-22.5 \mu$; epispore hyaline, $1-1.5 \mu$ thick, minutely and closely verruculose; germ pores small obscure, several, scattered. A few teleutospores and paraphyses are sometimes to be found in the uredo-sori.

III. Teleuto-sori mostly hypophyllous, only an occasional one on the upper leaf surface, minute, brownish-black, remaining covered by the epidermis; in more or less close groups, often in oblong groups flanking the groups of uredo-sori, above and below; groups of teleuto-sori ca. $\frac{1}{2}$ mm. broad and up to 4 mm. long. Single sori small, $50-75 \mu$ diam., $55-70 \mu$ deep, with spores in three rows; sometimes closely set, sometimes more remote, $10-180 \mu$ apart, the intervening space being filled with golden-brown, palisade-like paraphyses. Teleutospores ovate, ovate-ellipsoid or broadly cuneate; rounded, truncate or obtusely conical at the apex, attenuate, or more rarely rounded at the base; light brown, darker at the apex, $23-24 \times 18-27 \mu$; epispore smooth, thin at the base, ca. 1μ , becoming gradually thicker towards the apex, usually $1.5-2 \mu$ thick at the sides and 4μ , rarely 5μ thick at the apex. Pedicel hyaline or slightly tinted, persistent, up to 30μ long. Paraphyses light golden-brown, firmly agglutinated by their lateral walls, except where they are found with teleutospores in the uredo-sori; up to 50μ long and about 6μ thick.

on *Petamenes aethiopica* (L.) Phillips (= *Antholyza aethiopica* L.), Kentani, Pegler 2381, 9313.

7. *Uromyces Dieramatis* Doidge nov. spec.

sub *Uromyces Sparaxidis* Syd. in *Bothalia* II (1927) p. 31.

Uredo-sori amphigeni, sparsi vel aggregati, oblongi v. lineares, minuti v. usque 1 mm. longi, diutius epidermide tecti tandem ea longitudinaliter fissa cineti, ochracei. Uredosporae ovatae v. subgloboae, rarius ellipsoideae v. oblongae, $17.5-25 \times 12.5-20 \mu$, minute denseque verruculoso-echinulatae, membrana hyalina v. subhyalina ca. 1.5μ crassa, prois germ. 6-9, sparsis. Teleuto-sori amphigeni, singuli minuti, $75-100 \mu$ diam., $100-125 \mu$ alti, epidermide tecti, sed densissime in greges oblongos v. lineares usque 1 mm. longos dispositi et confluentes, paraphysibus periphiceis cylindraceis, subrectis v. leniter curvatis, aureo-brunneis anguste obvallati. Teleuto-sporae brunneae, leves, variabiles, ovatae, oblongae v. cuneatae, haud raro plus minus irregulares subinde e mutua pressione angulatae, apice rotundatae, truncatae v. subconicae, basin versus attenuatae, plerumque $20-30 \mu$ longae et $15-20 \mu$ latae, rarius $35-37.5 \mu$ longae et $10-12.5 \mu$ latae; episporio plerumque 2μ crasso, raro 1.5μ vel 2.5μ , ad apicem crassiore, $5-6 \mu$, nonnunquam usque 7.5μ ; pedicello usque 40μ longo, leniter colorato.

Hab. in foliis *Dieramatis penduli*, Cramond, leg. I. B. Pole Evans, 1580.

II. Uredo-sori not on definite leaf spots but often causing some light brown discolouration of the leaf tissues, amphigenous, scattered, or often very numerous and closely crowded, oblong or linear, not transverse, minute or up to 1 mm. long, long covered by the epidermis, which finally ruptures longitudinally and partly exposes the pale yellow spore masses. Uredospores ovate or subglobose, less frequently ellipsoid or oblong, very variable in form and size, $17.5-25 \times 12.5-20 \mu$; epispore hyaline or subhyaline ca. 1.5μ thick, closely and minutely verruculose-echinulate; germ pores 6-9, small, scattered.

III. Teleuto-sori interspersed with the uredo-sori, darker, remaining covered indefinitely, in closely crowded oblong or linear groups up to 1 mm. long. Single sori rather deep, $75-100 \mu$ diam., $100-125 \mu$ deep, each surrounded by a narrow palisade of pale golden-brown paraphyses. Teleutospores in 5 closely packed rows, often very irregular and angular through mutual pressure, golden-brown to chestnut-brown (the latter in the outer rows) ovate, oblong or cuneate; apex rounded, truncate or broadly conical, sometimes oblique; base attenuate; mostly $20-30 \times 15-20 \mu$, less frequently $35-37.5 \mu$ long and $10-12.5 \mu$ broad; epispore smooth, usually ca. 2μ thick, rarely 1.5 or 2.5μ , thickened at the apex $5-6 \mu$, rarely up to 7.5μ ; pedicel more or less persistent, tinted, especially near the apex, up to 40μ long and ca. 5μ broad.

on *Dierama pendulum* Bkr., Cramond, *Pole Evans* 1580, Type, 1451, 2410; Inanda, *Medley Wood* 585, 10475; Durban, *McClellan*, 31030; Bethlehem, O.F.S., *van der Merve*, 28815.

Dierama pulcherrimum Bkr., Kentani, *Pegler*, 6677, 6924, 7092.

Dierama sp., Nottingham Road, Natal, *McClellan*, 32308.

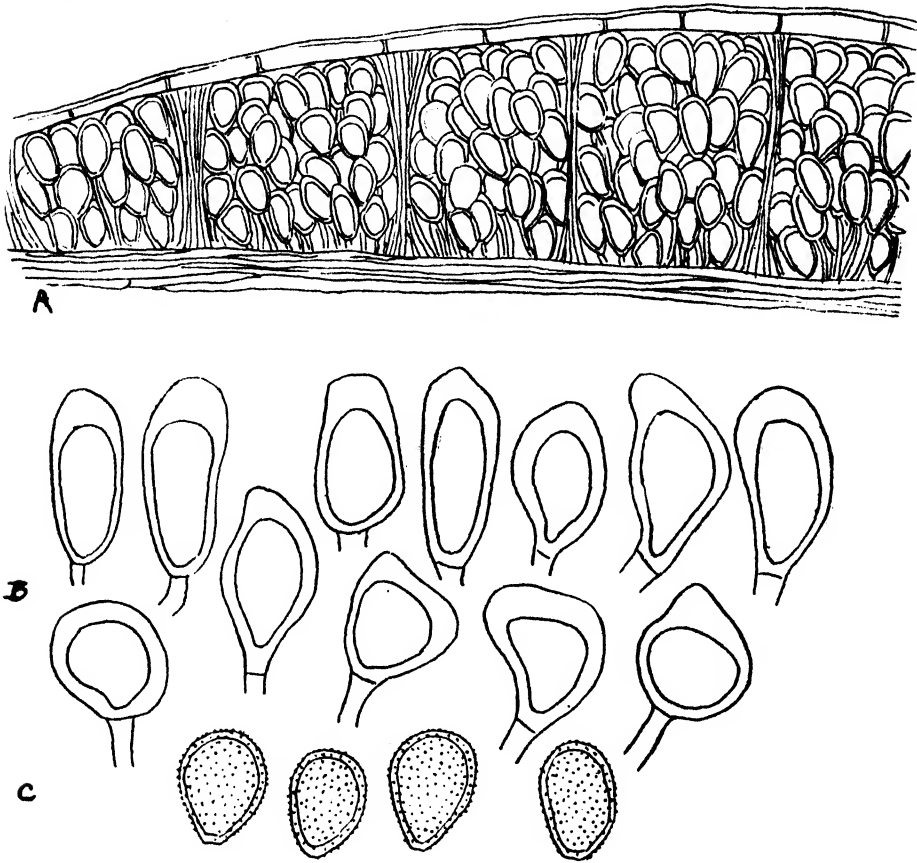


Fig. 7—*Uromyces Dieramae* Doidge.
(a) Section through teleutosorus.
(b) Teleutospores.
(c) Uredospores.

In *Bothalia* (l.c.) the fungus on *Dierama* was erroneously assigned to *Uromyces Sparaxidis* Syd. The wall of the teleutospore is ca. $2\ \mu$ thick, not $1.5\ \mu$ as required by the description of *U. Sparaxidis* and there are other minor differences; nothing is said about paraphyses in the description of the above species. The two rusts are closely related, but it is impossible to regard them as identical without an examination of the type of *U. Sparaxidis*. This is said to be "in foliis Sparaxidis lineatae, Natal, J. M. Wood"; unfortunately Medley Wood's number is not quoted. The identity of the host is also open to question, as *Sparaxis lineata* is a species confined to the winter rainfall area of the Cape, and does not occur in Natal.

Teleuto-sori are comparatively rare in most of the collections mentioned, which are rather heavily parasitised by *Darlucia filum*; some difficulty was experienced in finding typical sori for study.

8. *Uromyces Ferrariae* Doidge nov. spec.

Spermogonia plerumque hypophylla, modice copiosa in series ordinata, mellea, 100–130 μ diam. Aecidia hypophylla in greges ellipticos v. irregulares usque 5 mm. longos disposita, cupulata, 200–250 μ diam., margine albido, recurvato, lacerato; cellulae peridii laxae conjunctae, rhomboideae v. polygonales, 17.5–25 \times 14–17.5 μ , pariete exteriori striato 5–7 μ crasso, interiore verrucoso 3–4 μ crasso; sporae angulato-globoso, 17–22 μ diam., vel ovatae v. oblongae, 22.5–30 \times 12.5–17.5 μ ; membrana hyalina, ca. 1.5 μ crassa, dense minuteque verruculosa, Uredo-sori amphigeni, sparsi, minuti vel usque 1 mm. longi, mox nudi, dilute cinnamomei. Uredo-sporae subglobosae v. ovatae, 25–30 \times 19–22.5 μ , ubique dense verruculosae; membrana 2–2.5 μ crassa, poris germ. 5–9, sparsis praedita. Teleuto-sori amphigeni, inter uredo-soros sparsi, singuli minuti, 75–135 μ diam., 60–75 μ alti, epidermide tecti, sed densissime in greges oblongos usque 0.5 mm. longos, atros, dispositi et confluentes, paraphysibus periphicis obvallati. Teleutosporae castaneae, leves, plerumque subglobosae, subinde ovatae, obovatae v. cuneatae et e mutua pressione angulatae; apice rotundatae, late subconicae v. truncatae; basi rotundatae v. attenuatae; 22–32.5 \times 20–27.5 μ ; episporio 1–1.5 μ crasso apice leniter incrassato (usque 7.5 μ); pedicello leniter colorato usque 40 μ longo.

Hab. in foliis et pedunculis *Ferrariae* sp., Chipinga, 33427.

O. Spermogonia mostly hypophyllous, occasionally epiphyllous, near the groups of aecidia, in regularly spaced, longitudinal rows between the veins, rather numerous, honey-yellow, lenticular, 100–130 μ diam.

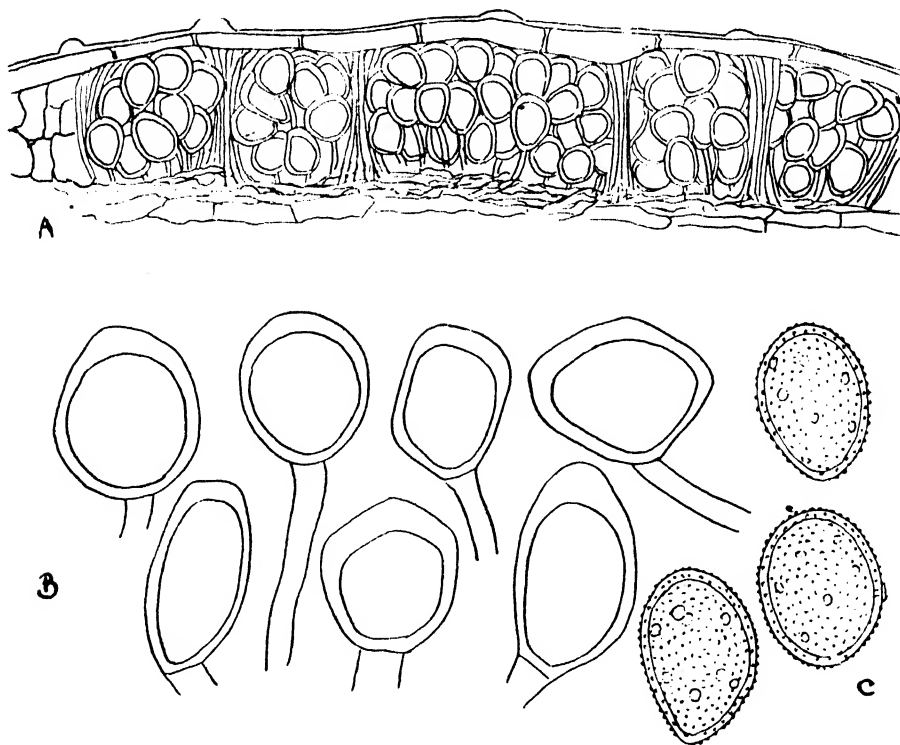


Fig. 8—*Uromyces Ferrariae* Doidge.
(a) Section through teleutosorus.
(b) Teleutospores.
(c) Uredospores.

I. Aecidia hypophyllous, in groups which are elliptic or sometimes irregular in outline and up to 5 mm. long, cupulate, 200–250 μ diam., margin white, recurved, lacinate. Cells of the peridium rather loosely connected and readily falling apart, rhomboid or irregularly angular, 17.5–25 \times 14–17.5 μ ; outer wall striate, 5–7 μ thick, inner verrucose, 3–4 μ thick. Spores angular-globose, 17.5–22 μ diam., or ovate to oblong, 22.5–30 \times 12.5–17.5 μ ; epispore ca. 1.5 μ thick, closely and minutely verruculose.

II. Uredo-sori amphigenous, scattered between the veins of the leaf, elongated (not transverse) minute or up to 1 mm. long; the raised epidermis ruptures longitudinally, early exposing the light brown spore masses. Uredo-spores subglobose to ovate, 25–30 \times 19–22.5 μ ; epispore closely verruculose, 2–2.5 μ thick; germ pores 5–9, scattered.

III. Teleuto-sori amphigenous, scattered, interspersed with the uredo-sori, oblong, up to $\frac{1}{2}$ mm. long, black, compact, parallel with the veins, not transverse, remaining covered; consisting of a number of individual sori more or less closely crowded. Individual sori 75–135 μ diam., 60–75 μ deep, covered by the epidermis, each surrounded by golden-brown, palisade-like paraphyses. Teleutospores closely packed in 3–4 rows, chestnut-brown, subglobose to ovate, obovate or cuneate, becoming more or less angular through mutual pressure; apex rounded, broadly conical or truncate; base rounded or attenuate; 22.5–32.5 \times 20–27.5 μ ; epispore smooth, 1–1.5 μ thick, slightly thickened at the apex (up to 7.5 μ). Pedicel persistent, slightly tinted, especially near the apex, 5–6 μ broad and up to 40 μ long.

on *Ferraria* sp., on leaves, spathes and peduncles, Chipinga, S. Rhodesia (Rh. 4298) 33427.

The spermogonia, aecidia, uredo- and teleuto-sori are all to be found on the same leaves, and all in good condition for study, although some of the aecidia were rather old. The teleuto-sori are predominantly hypophyllous, but fairly often develop more or less opposite to one another on each side of the leaf, sometimes they form at the edge of the uredo-sorus.

9. *Uromyces Anomathecae* Cke.

Cooke, *Grevillea* XIX (1890) p. 6 Sydow, *Monogr. Ured.* II (1910) p. 256, and *Ann. Myc.* XX (1922) p. 54, Doidge, *Bothalia* II (1927) p. 35.

O. Spermogonia amphigenous, not very numerous, interspersed with the aecidia, honey-yellow, 90–100 μ diam.

I. Aecidia amphigenous, in small groups up to 2 mm. diam., not crowded, globose, deeply immersed in the leaf tissue and long remaining covered by the epidermis, finally opening by means of a central pore, pale ochraceous, 150–200 μ diam. Cells of the peridium very loosely connected, irregularly polygonal, occasionally more or less rounded, 20–27.5 \times 15–25 μ ; outer wall smooth, 5–6 μ thick, inner verrucose, 3–4 μ thick. Spores hyaline or subhyaline, angular-globose, 17.5–22.5 \times 15–19 μ , rarely ellipsoid-oblong, 25–27.5 \times 13.6–14 μ ; epispore 1–1.5 μ thick, closely and very minutely verruculose.

II. Uredo-sori amphigenous, scattered or in loose groups, on brown leaf spots which are elongated in a direction at right angles to the leaf axis. Sori minute, round or oval, up to $\frac{1}{2}$ mm. diam., pale yellow, surrounded by the torn epidermis. Uredospores subglobose or ovate, less frequently ellipsoid, 20–24 \times 13–20 μ ; epispore hyaline, 1.5–1.7 μ thick, minutely but rather conspicuously verruculose echinulate; germ pores rather obscure, ca. 6–9, small, scattered.

III. Teleuto-sori minute, scattered or in oblong transverse groups, up to 1 mm. long, between the veins; often interspersed with the uredo-sori, but rarely developing round them. Individual sori compact, often developing opposite to one another on either side of the leaf, solitary or in more or less loose groups, but usually discrete, rarely confluent;

remaining covered by the epidermis, mostly 150–250 μ diam. and 50–70 μ deep, with three rows of closely packed spores; surrounded by a narrow palisade of pale golden-brown paraphyses. Teleutospores pale or darker chestnut-brown, oblong, ovate or cuneate, often irregular and angular through mutual pressure; apex broadly rounded, truncate or conical; base attenuate or rounded; 25–35 \times 16–24 μ ; epispore smooth, ca. 2 μ thick, thickened at the apex (5–9 μ); pedicel light brown, persistent, ca. 5 μ thick and up to 45 μ long.

on *Lapeyrousia cruenta* Bkr., Durban, Medley Wood 693, Co-type, 330; Stella Bush, Durban, Leslie, 31951; Winkle Spruit, Doidge, 2507; Donkerpoort, Pretoria District, Doidge and Bottomley, 30109.

Lapeyrousia grandiflora Bkr., Wonderboom, Pole Evans 443; Durban, 30937.

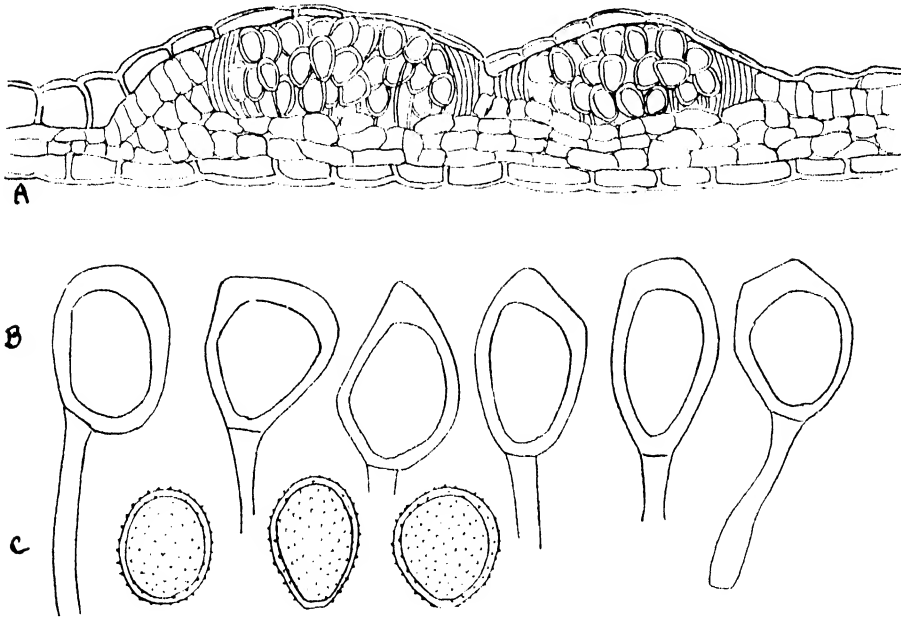


Fig. 9—*Uromyces Anomathecae* Cke., on *Lapeyrousia cruenta* (Medley Wood 693).

- (a) Section through teleutosorus.
- (b) Teleutospores.
- (c) Uredospores.

The aecidium, which has not been previously described, occurs on No. 443, in close association with typical teleuto-sori.

Lapeyrousia cruenta and *L. grandiflora* both belong to the sub-genus *Anomatheca* of the genus *Lapeyrousia*; they are closely related and may even be forms of the same species. *Lapeyrousia corymbosa* and *L. delagoensis* on which *Uromyces Ixiae* is found, belong to the sub-genus *Ovieda* and differ considerably.

10. *Uromyces Antholyzae* Syd.

Sydow, Ann. Myc. II (1904) p. 27 and Monogr. Ured. II (1910) p. 252. Verwoerd, Sc. Bull. 88, Union Dept. Agr. (1929) p. 5. Doidge, Bothalia III (1939) p. 510.

II. Uredo-sori amphigenous, not on leaf spots, but leaf tissues often vaguely discoloured, round or transversely oblong, minute, up to $\frac{1}{4}$ mm. diam., scattered or in transverse series 2–2.5 mm. long, limited in length by the veins; uredo-sori also develop on the peduncle, where they are scattered or in groups, elliptic or irregular in outline and up to 5 mm. long.

At first covered by the blistered epidermis, which finally ruptures, exposing the pale yellow, pulverulent spore masses. Uredospores usually globose or subglobose, less frequently ovate, rarely ellipsoid, $17.5-24 \times 15-17.5 \mu$, mostly $17.5-20 \times 17.5 \mu$; episporium hyaline or subhyaline, mostly 2μ thick, rarely 1.5 or 2.5μ , minutely but conspicuously verruculose-echinulate; germ pores small, rather obscure, 6-8, scattered.

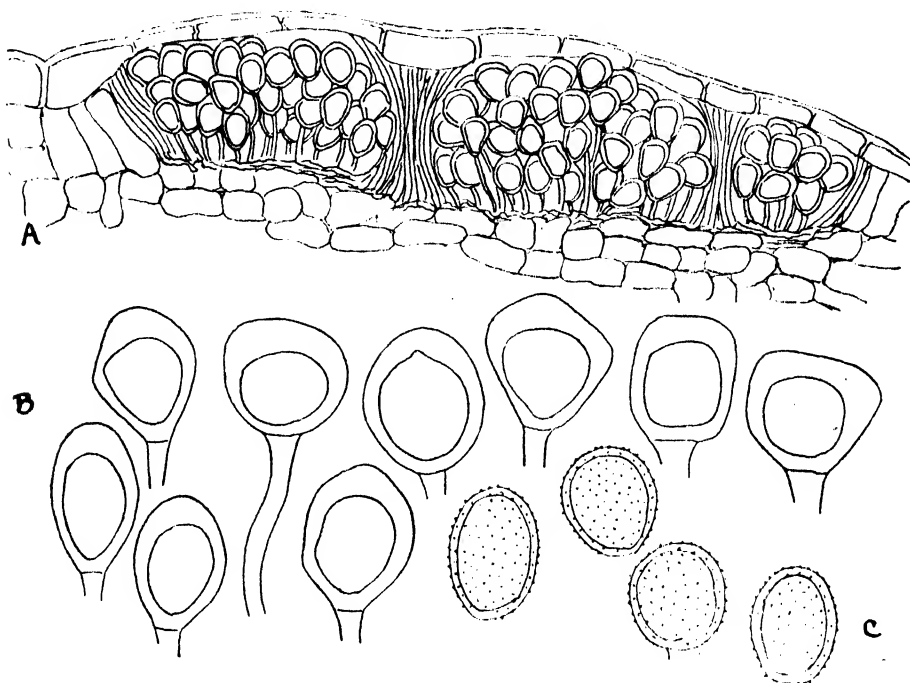


Fig. 10—*Uromyces Antholyzae* Syd.
(a) Section through teleutosorus.
(b) Teleutospores.
(c) Uredospores.

III. Teleuto-sori amphigenous, minute, often developing in the old uredo-sori, similar to the uredo-sori, but dark and remaining covered by the epidermis. Individual sori minute, ca. $100-250 \mu$ diam., $50-75 \mu$ deep, compact, each surrounded by a palisade, up to 10μ broad, of pale golden-brown paraphyses. Spores usually in 3, sometimes 3-4 rows. Teleutospores chestnut brown, subglobose, globose or oblong, often somewhat irregular through mutual pressure; apex usually broadly rounded or flattened, less frequently obtusely conical; base usually rounded, less frequently attenuate; mostly $20-25 \times 15-20 \mu$, rarely up to 30μ long and 22μ broad; episporium smooth, $1.5-2 \mu$ thick, thickened at the apex, $4-7 \mu$; pedicel persistent, rather stout, light brown, $5-6.5 \mu$ thick and up to 32μ long.

on *Anapalina revoluta* N. E. Br. (= *Antholyza revoluta*), Ruytersbosch, Mossel Bay, Gemmell 30085.

Uromyces Antholyzae has also been recorded by Verwoerd (l.c.) from Stellenbosch, Newlands and Knysna. It was originally described by Sydow "in foliis *Antholyzae abyssinicae* in Abyssinia (Schimper)." This host may be *Antholyza abyssinica* Bkr. now known as *Petamenes latifolia* N. E. Br., or *A. abyssinica* Brong, which is the same plant as *Oenostachys abyssinica* N. E. Br.

11. *Uromyces Freesia* Bubak.

in Oesterr. Bot. Zeitschr., L. (1900) p. 318. Sydow, Monogr. Ured. II (1910) p. 252.
Doidge, Bothalia II (1927) p. 32.

II. Uredo-sori amphigenous, on brown leaf spots, scattered, minute, round or oval, up to $\frac{1}{4}$ mm. long, light brown, surrounded by the torn epidermis, which usually splits in a direction transverse to the leaf axis. Uredospores mostly ovate, less frequently subglobose or ellipsoid, $19-24 \times 12.5-17.5 \mu$, mostly $19-20 \times 13-15 \mu$; epispore hyaline, ca. 1.5μ thick, closely and minutely verruculose, and with 6-9 small, scattered, rather obscure germ pores.

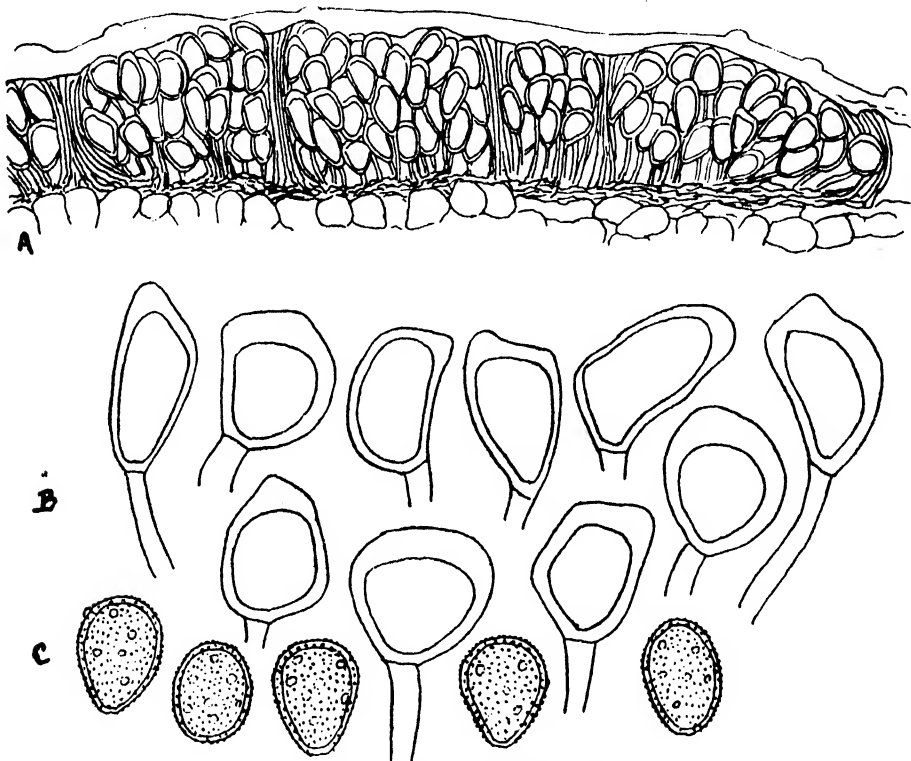


Fig. 11—*Uromyces Freesia* Bubak.
(a) Section through teleutosorus.
(b) Teleutospores.
(c) Uredospores.

III. Teleuto-sori minute, brownish-black, scattered or developing in circles round the uredo-sori, long covered by the epidermis. Individual sori small, up to ca. 100μ diam., at first distant and each surrounded by a palisade of pale golden-brown paraphyses, often becoming closely crowded and sometimes completely fused; in the latter case the paraphyses are not always distinguishable through the older sections of the sori, but at the margin of the groups of sori, paraphyses are still evident. Sori compact, $60-80 \mu$ deep, with 3-4, mostly 4 closely packed rows of spores. Teleutospores mostly ovate to ellipsoid, occasionally subglobose or clavate, but often very irregular, asymmetrical or angular through mutual pressure; light to deep chestnut-brown, the darker spores in the outer rows of the sorus; apex rounded, truncate or conical; base rounded or attenuate; $20-35 \times 15-22 \mu$, mostly $20-30 \times 17-20 \mu$; epispore smooth, $2-2.5 \mu$ thick, thickened at the apex, $5-9 \mu$; pedicel subsistent, hyaline, ca. 5μ broad at the apex and up to 55μ long.

on *Freesia* sp., Johannesburg, 17283; Joubertina, Cape Deyssel, 29714.

According to Sydow (l.c.) paraphyses are to be found among the uredospores; they are clavate, ca. $40\ \mu$ long and $9\text{--}16\ \mu$ broad. This statement was quoted by Doidge (l.c.). In the material examined, no paraphyses were found in the uredo-sori, but the sori were rather old and there were comparatively few spores left in position.

The genus *Freesia* has been revised and it cannot be said whether the host of the above collections is the plant now known as *Freesia refracta*. The type was "in foliis *Freesiae odoratae* in Promontorio Bonae spei Africa austr. (Zeyher)"; this collection has not been available for study.

12. *Uromyces transversalis* (Thuem.) Wint.

Winter, Flora (1884) p. 263; Sydow, Monogr. Ured. II (1910) p. 257; Doidge, Bothalia II (1927) p. 33.

Uredo transversalis Thuem., Flora (1876) p. 570; Kalchbrenner, Grevillea XI (1882) p. 25.

Uromyces Watsoniae Syd., Monogr. Ured. II (1910) p. 258.

II. Uredo-sori amphigenous, scattered or in groups, which are often oblong, transverse and limited by the larger veins of the leaf, round to oblong or irregular, but typically transversely oblong, sometimes minute up to $\frac{1}{2}$ mm. long, but often longer, up to $1\frac{1}{2}$ mm. long and $\frac{1}{2}$ mm. broad; on all hosts longitudinal sori are also found, $\frac{1}{2}$ mm. to 2 mm. long, but these are more numerous on *Watsonia*; sori at first covered by the blistered epidermis which finally splits; dehiscence usually transverse, but parallel with the leaf axis in the longitudinal sori and sometimes irregular; the ochraceous spore masses remain partially veiled by the torn epidermis. Uredospores variable in form and size, ovate, ellipsoid or oblong, $14\text{--}26 \times 13\text{--}25\ \mu$; epispore hyaline, typically $1.5\ \mu$ thick, rarely up to $2\ \mu$, closely and minutely verruculose; germ pores rather obscure, 6-8, scattered.

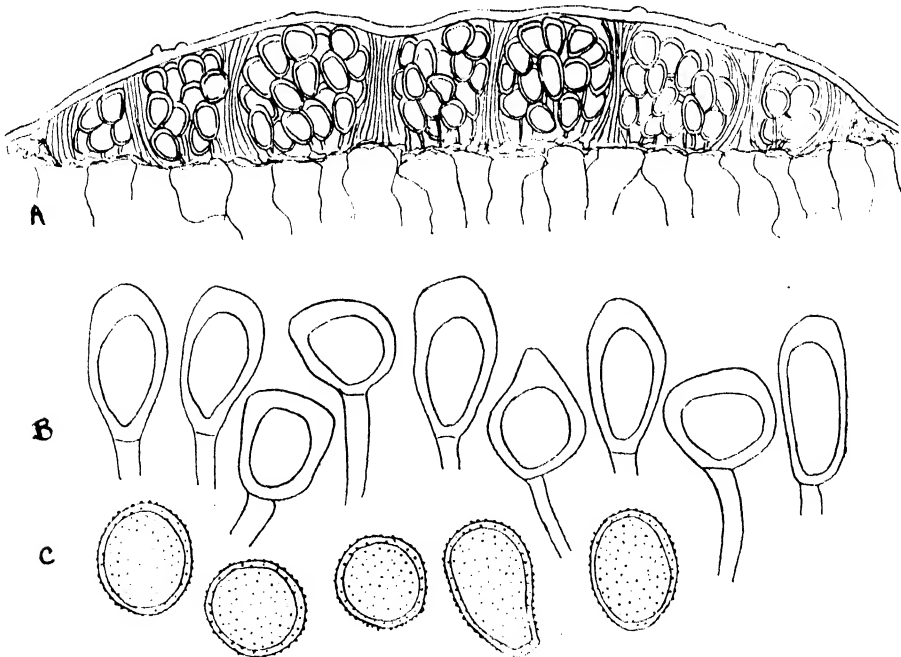


Fig. 12—*Uromyces transversalis* (Thuem.) Wint.

(a) Section through teleutosorus on *Tritonia*.

(b) Teleutospores from *Tritonia*.

(c) Uredospores from *Tritonia*.

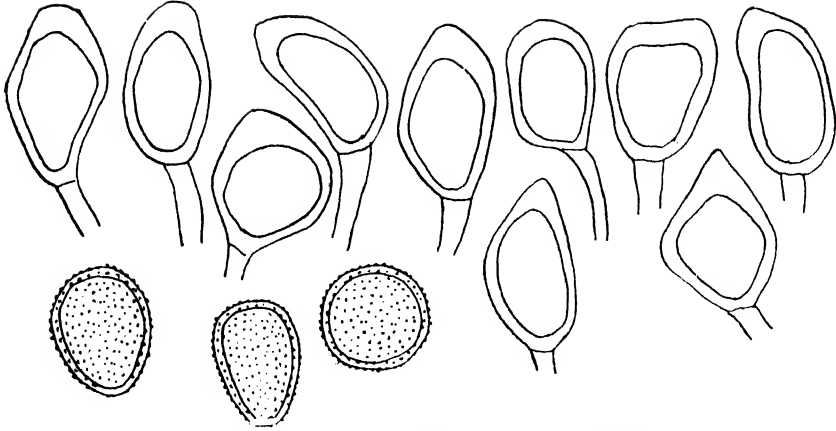


Fig. 13—*Uromyces transversalis* (Thuem.) Wint.
Teleutospores from *Gladiolus*.
Uredospores from *Gladiolus*.

III. Teleuto-sori minute, black, remaining covered by the epidermis, in small or larger groups, which may be scattered, but not infrequently form an irregular zone round a uredosorus or a group of uredo-sori. Single sori small, crowded together, separated only by a zone of golden-brown, palisade-like paraphyses; $50-112.5\ \mu$ diam., $55-75\ \mu$ deep, with spores in 3-4 closely packed rows. Teleutospores ovate, ellipsoid or pyriform, less frequently globose, often irregular or angular through mutual pressure, light brown, darker—often chestnut-brown—near the apex; apex rounded, truncate or broadly conical; base usually attenuate, less frequently rounded; $17.5-34 \times 14-21\ \mu$, the majority being $20-25 \times 15-17.5\ \mu$; epispore smooth, usually ca. $2\ \mu$ thick, thickened at the apex, $4-6\ \mu$, rarely up to $8\ \mu$; pedicel subsistent, hyaline or tinted at the apex, ca. $3\ \mu$ thick and up to $45\ \mu$ long.

on *Gladiolus psittacinus* Hk., Sydenham, Natal, *Medley Wood* 360.

Gladiolus Saundersii Hk. f., Somerset East, MacOwan.

Gladiolus spp., Port Elizabeth, *Clark*, 26611; Nottingham Road, *McClellan*, 32310; Mooi River, Natal, *Mogg*, 10077, 17037; Rosetta, *Mogg*, 11635, 14145; Entumeni, Zululand, *Haygarth*, 14176, 14181; Arcadia, Pretoria, 472; Garstfontein, Pretoria District, *Pienaar*, 1258; Debbé's Ravine, *Bosman*, 29853; Silverton Road, *Doidge*, 29418; Kaalfontein, *Pole Evans*, 10134 and *Mogg*, 11676; Paardeplaats, Lydenburg Distr., *Pienaar*, 1503; Brits, *Sieling*, 30981; Belfast, *Pole Evans*, 10987,

Tritonia lineata Ker., Capetown, *MacOwan*, 4064 (Rabh. Fung. Eur. 3724).

Tritonia securigera Ker., Boschberg, *MacOwan* 1254 (Type) 3355, 20780, (Rabh. Fung. Eur. 3014); Uitenhage, *Schmutz*, 25488.

Tritonia sp., Kentani, *Pegler* 2435, 10992.

Watsonia angusta Ker., Kentani, *Pegler* 2360, 2379, 9165, 9192.

Watsonia densiflora Bkr., Belfast, *Doidge*, 552 (co-type of *Uromyces Watsoniae*).

Watsonia meriana Mull., Paddock, Natal, *McClellan*, 33322.

Watsonia spp., Sweetwaters, Natal, *Cromden*, 23182; Cana, Basutoland, *Hean*, 32142.

This species is widespread throughout the Union, and is particularly common in the Transvaal, where it causes a serious disease of cultivated Gladioli.

There appears to be no significant difference between *Uromyces Watsoniae* and *U. transversalis*. Sydow states that the wall of the teleutospore is only $1\ \mu$ thick in the former species, but in all the specimens examined, including the type collection, it was predominantly $2\ \mu$ thick.

DESCRIPTIONS OF SOME NEW HYMENOMYCETES.

By E. M. Wakefield and P. H. B. Talbot.

***Asterostromella Rumpiana* Talbot, sp. nov.**

Fungus resupinatus, late effusus, adnatus, ad 2 mm. crassus. Contextus durus, suberofibrosus, distincte stratosus, pallide succineus. Hymenium laeve; color ad bubalinum proxime accessit. Basidia clavato-cylindracea, $30 \times 4.5 \mu$, inter hyphae hymeniales dispersa. Sporae elliptico-ovales, hyalinae, $8.3 \times 5.5 \mu$, subtiliter punctulatae. Gloeocystidia tenue tunicata, immersa, $53-80 \times 6.5 \mu$, intus homogenea. Hyphae crasse tunicatae vel interdum lumene obliiterato, hyalinae vel pallide coloratae, ramosae sed non dendroideae, usque ad 3μ crassae, in 5 per centum KOH fuscescentes. Crystalla multae inter strata adsunt.

Hab. ad lignum in sylvis, Nkandhla, Zululand, leg. W. G. Rump (399), 30200.

Named in honour of Mr. W. G. Rump of the Natal Museum, who by his energetic collecting has greatly advanced our knowledge of South African Hymenomycetes. Type in Kew Herbarium, with isotype in Pretoria.

In structure this species comes close to *Stereum duriusculum* B. & Br. from which it differs in having a darker hymenium and context colour, a different spore size and shape, and smoother contents to its gloeocystidia. (Further discussion on the structure of *S. duriusculum* will be published at a later date in this journal, in which it will be pointed out that this species possesses gloeocystidia and might profitably be considered, with *Corticium portentosum* B. & C. as well, as an *Asterostromella*).

***Coniophora papillosa* Talbot, sp. nov. [Fig. 1.]**

Resupinata, late effusa, non adnata, 500μ crassa, fragilis, interdum in sicco fissae; hymenio griseo-sepiaceo cum papillis parvis, fertilibus, hemisphaericis, discretis, superficialiter ortis; contexto fusco; basidia rara, emersa, cylindraceo-clavata, hyalina; $25-30 \times 4-5 \mu$, sterigmatibus 2 vel 4, brevibus; sporae multae, in trama positae vel liberae, ovatae vel ellipticae, laeves, flavido-brunneae, $7.5-10 \times 4-6 \mu$, crasse tunicatae; hyphae basales 2μ crassae congestae ramosae atrobunneae, hyphis superioribus conglutinatiss vel quasi pseudoparenchymaticis.

Hab. ad ligna, Venterspost Gold Mining Co., Ltd.

Resupinate, widely effused, not adnate, 500μ thick, brittle, cracked occasionally when dry. Hymenium dark drab, covered with small, hemispherical, discrete, fertile papillae of superficial origin. Context fuscous. Basidia rarely seen, not in palisade, cylindric-clavate with 2 or 4 short sterigmata, hyaline, $25-30 \times 4-5 \mu$, projecting almost their full length above the mass of tissue. Spores elliptical or ovate, occasionally subglobose, yellowish-brown, $7.5-10 \times 4-6 \mu$, sometimes with one side flattened, very numerous and embedded in the upper tissues of the trama, hyaline when immature, thick-walled, sometimes guttulate, smooth. Tissue differentiation: Basal layers composed of much interwoven, branched, very dark coloured hyphae, 2μ wide. The remainder of trama composed of lightly coloured to hyaline tissue which is indistinct or in parts almost pseudoparenchymatous, becoming progressively lighter in colour towards the hymenium.

Specimens examined: on timber, Venterspost Gold Mining Co., Ltd., 23/10/42, Timber Research Lab. 1852, Type in Kew Herbarium (produces a brown rot in culture); on indigenous wood in swamp bush, Compensation Beach, Natal, W. G. Rump 393, 30194.

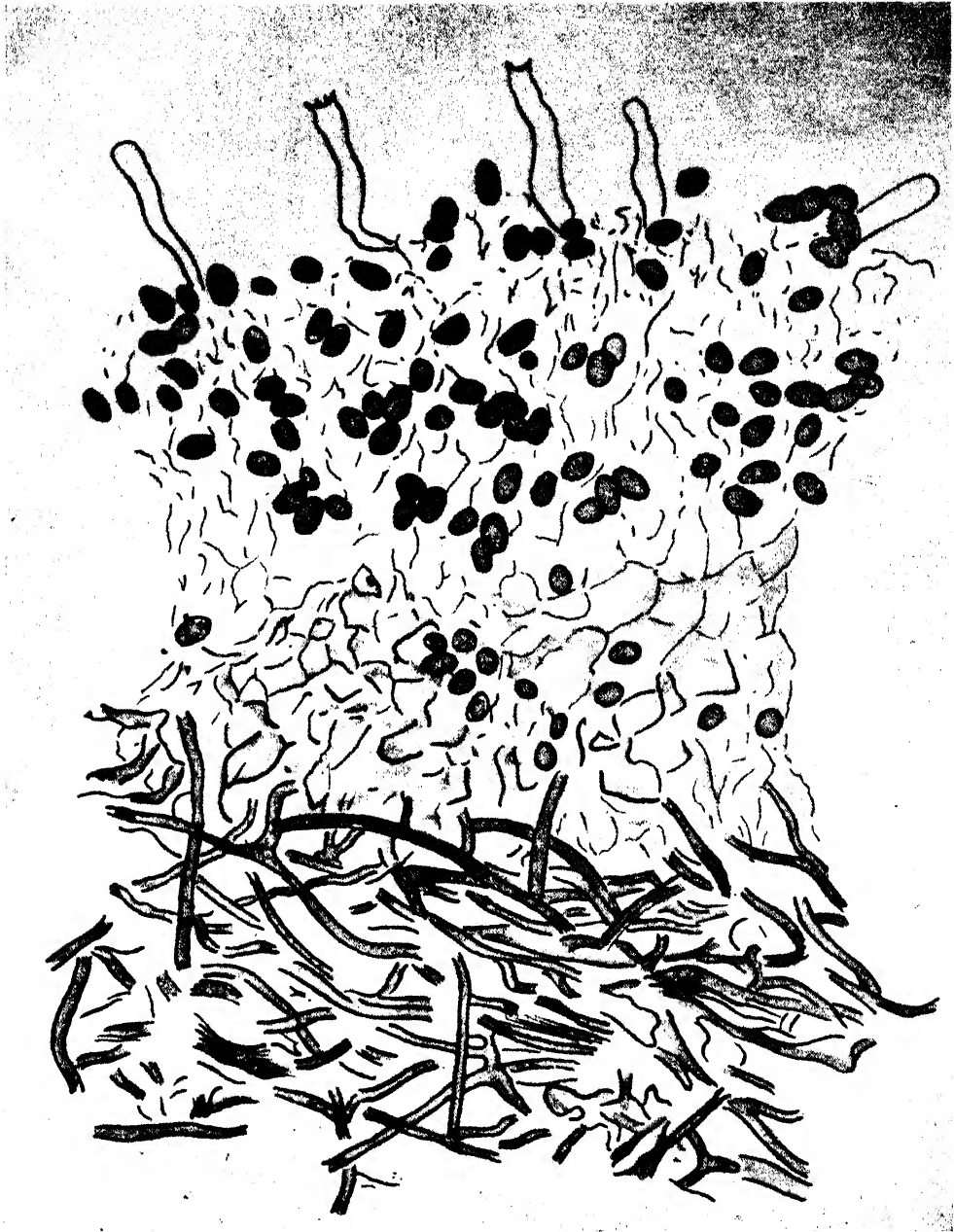


FIG. 1. *Coniophora pay illosa*. X 850.

***Corticium gloeosporum* Talbot, sp. nov.**

Fungus resupinatus, juvenile orbiculatus, demum late effusus, confluent, adnatus, siccitate in aerolas frustulatas disruptus, subiculo candido fibrilloso, contextu cremeo, 200–500 μ crasso. Margo definitus vel radiato-fibrillosus mox liberatus. Hymenium sub-

ceraceum, undulatum vel tuberculatum, sublaeve, cremeum vel pallide incarnato suffusum. Basidia cylindraceo-clavata dense fasciculata, $24-30 \times 4.5-5 \mu$, plerumque basi septato-nodosa. Sporae hyalinae, laeves, obovatae, attenuato-apiculatae, plerumque curvatae, conglutinatae, $5.5-6.5 \times 3-4 \mu$. Cystidiola rara, hyalina, fusiformia, tenue tunicata, interdum uniseptata, $32 \times 4 \mu$. Hyphae subhymeniales plus minus verticales, non distinctae; basales distinctae, ramosae, septatae, frequenter nodoso-septatae, $2-5 \mu$ crassae, dense intertextae, subdecumbentes.

Hab. ad lignum, Town Bush, Pietermaritzburg, leg. W. G. Rump (212) 28288.

Specimens examined: on wood, Town Bush, Pietermaritzburg, W. G. Rump 212, 28288 (Type in Kew Herbarium with isotype in Pretoria); on bark, Bulwer, Natal, 1934 W. G. Rump 26, 27603.

This specimen corresponds almost exactly with *Corticium laeve* Persoon in external features but is perhaps more areolately cracked and thinner at the margin. Microscopically it differs in having spores and basidia which are considerably smaller. (*C. laeve* basidia $25-40-90 \times 4.5-9 \mu$; spores $7-9-12 \times 4.5-7 \mu$ in European specimens). These two species both have similar cystidioles, hyphae and basal clamps on the basidia, while another point of similarity is the highly characteristic pip-shaped, agglutinated form of the spores. *C. laeve* has not yet been recorded from South Africa.

Corticium luteocystidiatum Talbot, sp. nov. [Fig. 2.]

Resupinatum, coriaceum, udo separabile, sicco in areas amplas fissum; margo elevatus et interdum subtiliter dentatus; hymenium ochraceo-salmonicolor vel pallide aurantiacum, laeve vel papillosum vel radiato-rugosum; contextus concoloratus, plus minus 300μ crassus; basidia clavata, usque 40μ longa; sporae $9-11.5 \times 4.5 \mu$, hyalinae, laeves, cylindraceae vel ellipsoideae, saepe uno latere plano; gloeocystidia multa, conspicua, praeter regionem subiculi per omnes partes numerosa, flavo-oleosa, irregulariter elongata.

Habitat ad ligna, Town Bush, Pietermaritzburg, leg. W. G. Rump. 28307.

Resupinate, not adnate, cracking into large, separated areas; margin lifting on drying, sometimes finely indented, *Hymenium* ochraceous salmon drying to pale orange, almost smooth or papillate or with raduloid ridges. *Context* concolorous, about 300μ thick. *Basidia* clavate, of variable length, up to 40μ long. *Spores* $9-11.5 \times 4.5 \mu$, hyaline, smooth, cylindric or ellipsoid with one side depressed or flattened. *Gloeocystidia* numerous, conspicuous, with bright yellow, oily globular content, scattered throughout tissues except next to subiculum, often penetrating hymenium but not projecting beyond, irregular elongated outline, about $60-80 \times 6-14 \mu$.

Specimens examined: Town Bush, Pietermaritzburg, W. G. Rump 241, 28307. Type in Kew Herbarium with isotype in Pretoria; Impolweni, Natal, Rump 167, 28557; Town Bush, Pietermaritzburg, Rump 283, 28690; ? Xumeni Forest, Donnybrook, Natal, E. M. Doidge, 28947 (this specimen is badly insect-eaten); ? Town Bush, Pietermaritzburg, Rump 319 b, 28679.

Corticium tumulosum Talbot sp. nov. [Fig. 3.]

Resupinatum $60-100$ (-200) μ crasso, adnatum, orbiculatum deinde effusum, transverse parallele profunde fissum, contextu ochraceo; margo pallidus, attenuatus, definitus; hymenium tuberculatum, ceraceum, radulatum vel papillosum, radula fusca, caeterum ochraceo-rufulum; crystalli multa in stratibus inferioribus; basidia cylindraceo-clavata, $28-35 \times 5.5 \mu$, sterigmatibus 4, brevibus, curvatis; sporae hyalinae, laeves, late ellipsoideae, $4.5-5.5 \times 3-4.2 \mu$; hyphae distinctae, decumbentes, multiseptatae, $3-4 \mu$, pallido-fuscae, paucae subhymeniales non coloratae.

Hab. ad lignum, The Willows, Pretoria, leg. K. A. Iansdell, 28897.

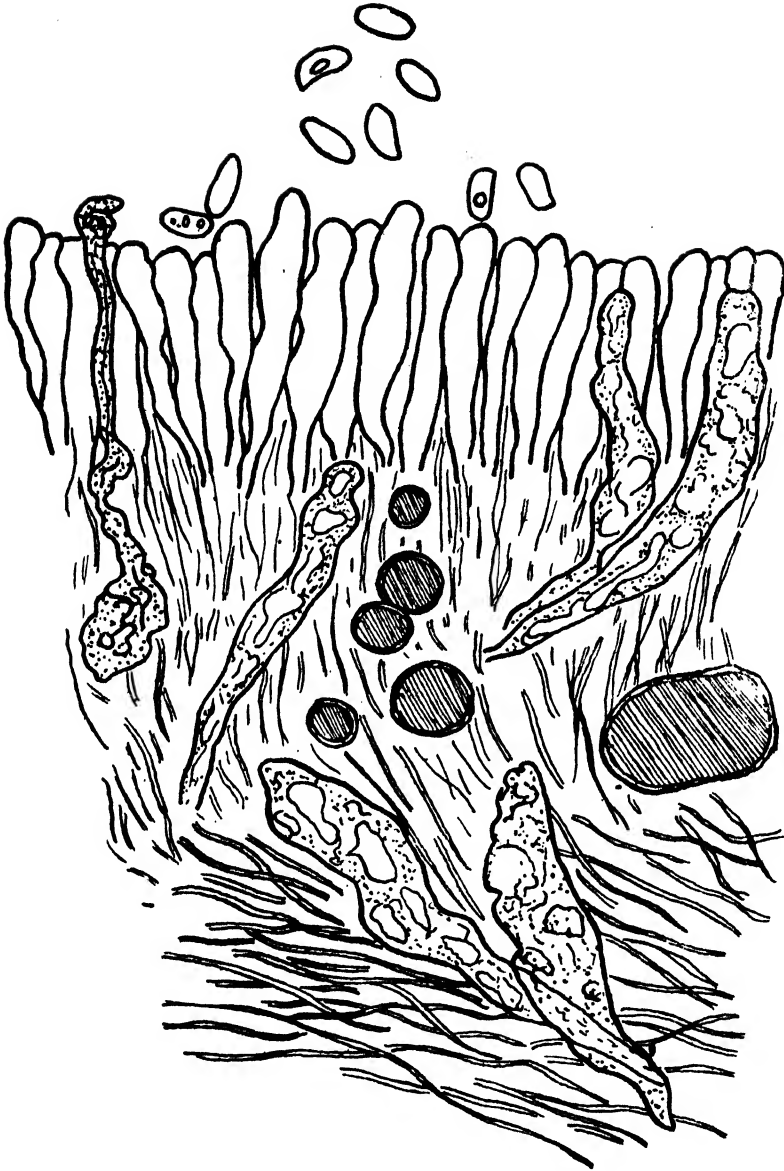


FIG. 2. *Corticium luteocystidiatum*, X 850.

Resupinate, closely adnate, orbicular becoming effused, cracking deeply in one direction, showing dingy yellow context; margin thinning out to a definite pale coloured edge. *Hymenium* tuberculate, waxy, papillate or ridged, raised portions being liver-brown while remainder is reddish-olive; thin in section, 60–100 μ , up to 200 μ including crystals and periderm of host; minerals numerous at base, amorphous or crystalline. *Basidia* cylindric-clavate, 28–35 \times 5.5 μ , with 4 short, curved sterigmata. *Spores* hyaline, smooth, broadly ellipsoid, 4.5–5.5 \times 3.4–2 μ . *Hyphae* distinct, pale yellowish, horizontal, frequently septate, 3–4 μ wide. The few hyphae which are curved abruptly into the hymenium are colourless.

Specimens examined: The Willows, Pretoria District, 27.4.37, K. A. Lansdell 28897, Type in Kew Herbarium with isotype in Pretoria.

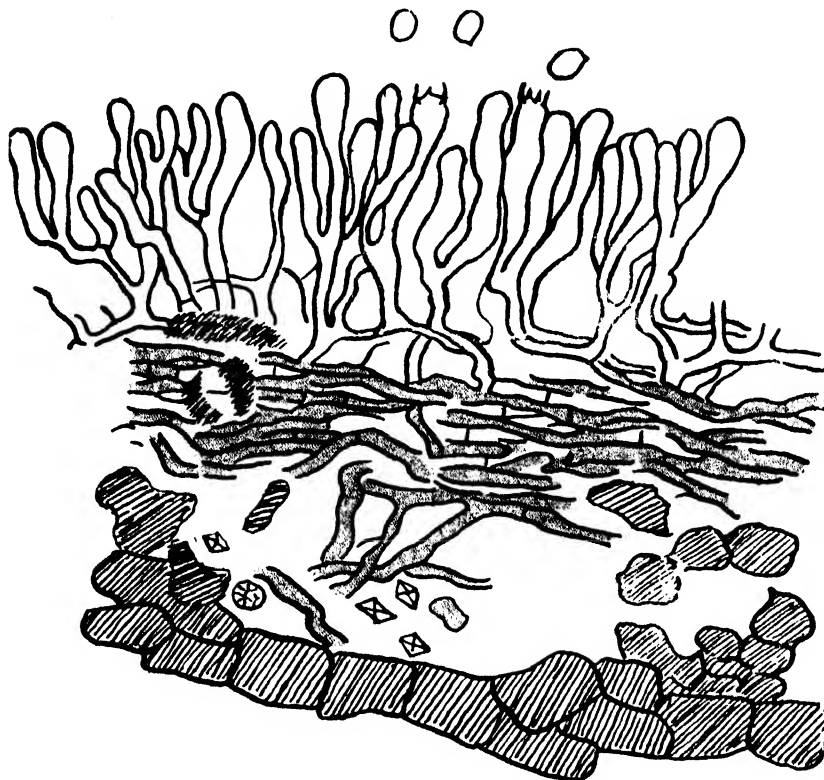


FIG. 3. *Corticium tumulosum* X 800.

***Hymenochaete fasciculata* Talbot, sp. nov.**

Fungus resupinatus, adnatus, siccitate rimosus, fragilis. Hymenium granulosum vel tuberculosum, vinaceo-brunneum (Verona Brown-Ridgway). Contextus 250–400 μ crassus. Basidia et sporae non visae. Setae ad 50 μ emergentiae, vel per totum contextum immersae, castaneae, incrustatae, 70–80–(120) \times 6.6–9 μ , cylindraceo-subulatae, solitariae vel dense fasciculatae. Hyphae flavo-brunneae, 1 μ crassae, plerumque dendritico-ramosae; basales stratum fuscum efformantes.

Hab. ad lignum, Town Bush, Pietermaritzburg, leg. W. G. Rump (220), 28297.

Specimens examined: on wood, Town Bush, Pietermaritzburg, Rump 220, 28297, Type in Kew Herbarium, with isotype in Pretoria; Town Bush, Pietermaritzburg, Rump 262, Oct. 1934, 28500.

This species falls in a group with *H. corrugata* and *H. fuliginosa* on account of its lacking a non-setigerous hyphal layer, but is distinguished by its setae which are characteristically fasciculate with as many as 8–12 setae per fascicle under the hymenial papillae. The hymenium in No. 28500 is smoother and fasciculation is not so marked, though still present. *H. lictor* Petch (in Ann. Roy. Bot. Gard. Perad. 9 (1925) 277), at one time confused with *H. fuliginosa*, has setae in fascicles (up to 6 per fascicle) but differs from the new species in its smoother reddish hymenium, a lighter context, a light yellow dense basal seam and in possessing cavities in the trama. The hyphae of *H. lictor* are not quite so narrow nor so dendroid as those of *H. fasciculata*.

Hymenochaete ochromarginata Talbot, sp. nov.

Pileus reflexo-dimidiatus, lateraliter connatus, imbricatus, durus, non flexilis, 4×2 cms. Superficies superior concentric sulcata, velutinata, sub-badia, tritu ochracea. Hymenium laeve, haud rimosum, castaneum (Argus Brown-Ridgway). Margo acutus, ochraceus, ad 1 mm. latus. Contextus ochraceus, 500–600 μ crassus. Basidia et sporae non visae. Setae ad 20 μ emergentiae vel in strato usque ad 160 μ crasso immersae, subulatae, flavo-brunneae, 1.5 μ diam., dense intertextae, plus minus decumbentes, trama utrinque strato fusco instructa. Tomentum pilei velutinum, hyphis similis.

Hab. ad lignum, Tenadu, Tembuland, legit P. J. Pienaar, 2133.

Specimens examined: Tenadu, Tembuland, 26.2.1912, P. J. Pienaar, 2133, Type in Kew Herbarium with isotype in Pretoria; Cameroons, T. D. Maitland 93, Cameroon Mts., 4500 feet, 1930 (in Herb. Kew).

In microscopic structure this species falls in the group with *H. rigidula*, *H. tabacina* and *H. rubiginosa*. There is no likelihood of confusion with *H. tabacina*. *H. rubiginosa* may be distinguished by its longer, narrower setae ($50-60 \times 5-6 \mu$), its colliculose, bistre hymenium and wider hyphae (2.5 μ). *H. rigidula* is predominantly resupinate and has darker, wider hyphae (3–4 μ). In Herb. Kew are several specimens from Ceylon under *H. rigidula* B. & C. (No. 3042, 6670, 3866, 6058, 4031) which in micro- and macroscopic characters connect very closely with the new species, differing only slightly in colour. Petch (in Ann. Roy. Bot. Gard. Perad. 9 (1925) 272) gives notes on *H. rigidula* and concludes: "It would seem probable that the Ceylon species is not the same as that from Cuba." (Type from Cuba). With this I concur and would suggest that the Ceylon specimens, quoted above, be placed under *H. ochromarginata*.

Peniophora arenata Talbot, sp. nov. [Fig. 4.]

Resupinata, late effusa, pelliculosa, udo separabilis, sicco fissa, subiculo candido fibrilloso, contextu candido, margine candido plus minus radiato fibrilloso; hymenium subalbidum vel arenatum, farinaceum, subtiliter granulosum: basidia clavata, $23-30 \times 3-5 \mu$; sporae $6.5-8 \times 2.5-3 \mu$, cylindraceae, saepe attenuatae et curvatae, laeves; cystidia immersa raro emergentia, cylindracea, crasse tunicata, dense incrustata, e media trama oriunda, interdum apicibus bifidis, interdum fasciculata, $50-120 \times 6-10 \mu$; hyphae hyalinae distinctae, crasse tunicatae, sparse nodosae, multiseptatae, interdum granulis incrustatae, 3–6 μ ; hyphis subhymeniales laxae intertextae, plus minus erectae, basales crassiores, dense intertextae, decumbentes.

Hab. ad ligna, Cato Ridge, leg. W. G. Rump 34, 27645.

Resupinate, widely effused, pellicular, easily separable when moist, cracking and revealing a whitish fibrillose subiculum, orbicular when young; context white; margin whitish, more or less radiately fibrillose. Hymenium almost white, light sandy buff, pruinose, farinaceous or finely granular. Basidia clavate, $23-30 \times 3-5 \mu$. Spores $6.5-8 \times 2.5-3 \mu$, cylindric, usually with one end attenuated and slightly curved, smooth. Cystidia immersed, rarely projecting, cylindrical, thick-walled, heavily encrusted, attenuated basally into a long, hypha-like cystidiophore originating in mid-trama, sometimes forking briefly at apex, sometimes in closely grouped fascicles, $50-120 \times 6-10 \mu$. Hyphae distinct, hyaline, rigid, thick-walled, with very sparse clamp connections, frequently septate, sometimes encrusted, 3–6 μ wide. Basal hyphae dense, horizontal, stouter than those of the subhymenium which are arranged in a loose semivertical layer.

Specimens examined: Cato Ridge, 1934, W. G. Rump 34, 27645, Type in Kew Herbarium with isotype in Pretoria; Xumeni Forest near Donnybrook, 1935, Morgan and Doidge, 28916; The Caverns, Drakensberg 20.7.37, A. M. Bottomley, 28891; Champagne Castle, Feb. 1945, W. G. Rump 733, 35314; Boschfontein Kloof, Wolhuterskop, Transvaal, 5.5.39, Doidge and Bottomley, 33209.

Specific name from *arenatus*—"mingled with sand"; near *P. leprosa* Bourd. & Galz., which differs in that its cystidia are often emergent and that the basal layers of the trama contain thick-walled, encrusted hyphae in marked contrast to the subhymenial layer of rather indistinct hyphae.

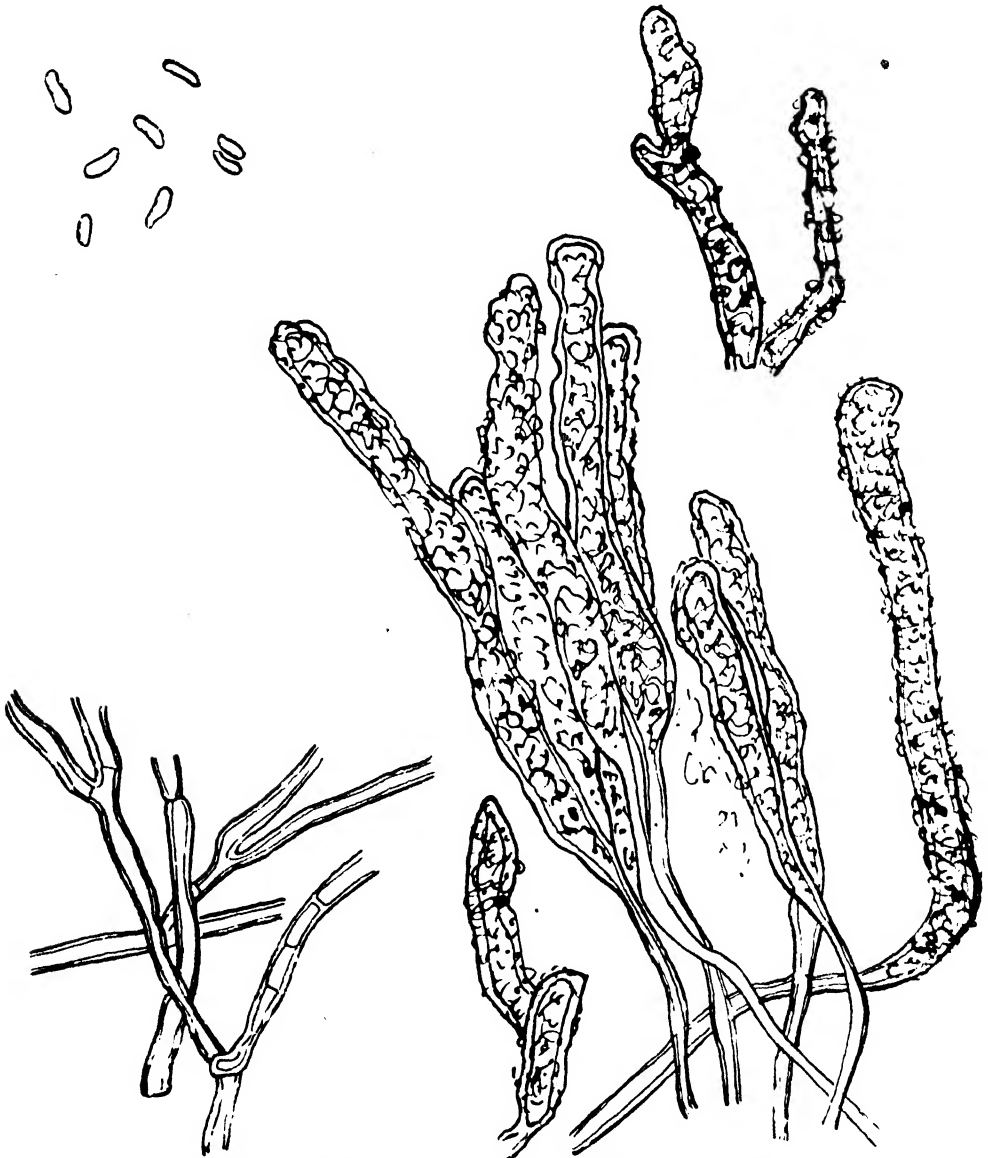


FIG. 4. *Peniophora arenata*. Spores, cystidia, hyphae X 850.

***Stereum rimosum* Berk. var. *africanum* Talbot nov. var.** [Fig. 5.]

A typo facie microscopico non diversum, habitu resupinato-reflexum (nec pileatum vel sessili-umbonatum), tomento crassiore, hymenio rugosiore, magis zonato, pallidiore.

Habitat ad ligna, Karkloof, Natal, Leg. Rump, 30233.

Effused, resupinate-reflexed, sometimes sessile attached by a broad umbo, or composed of several connate, resupinate-umbonate pileoli each roughly circular in outline, coriaceous; surface cinnamon-buff colour, concentrically furrowed, covered with a thick felty pad-like tomentum; margin even or lobate. *Hymenium* rimose, showing silky pallid context, often concentrically zoned, warm buff or pinkish-buff, when old becoming darker and more vinaceous colour. *Basidia* closely aggregated, $4.2\ \mu$ wide at apex. *Spores* hyaline, smooth, elliptic-ovate with one side frequently depressed and with a small apiculus, $3.5-5.5 \times 2-3\ \mu$. •Coloured conducting organs (indicating a "bleeding" species when fresh) yellow, $5.5-8.5\ \mu$ wide, with rigid walls, in a layer about $200\ \mu$ wide, distributed in subhymenium

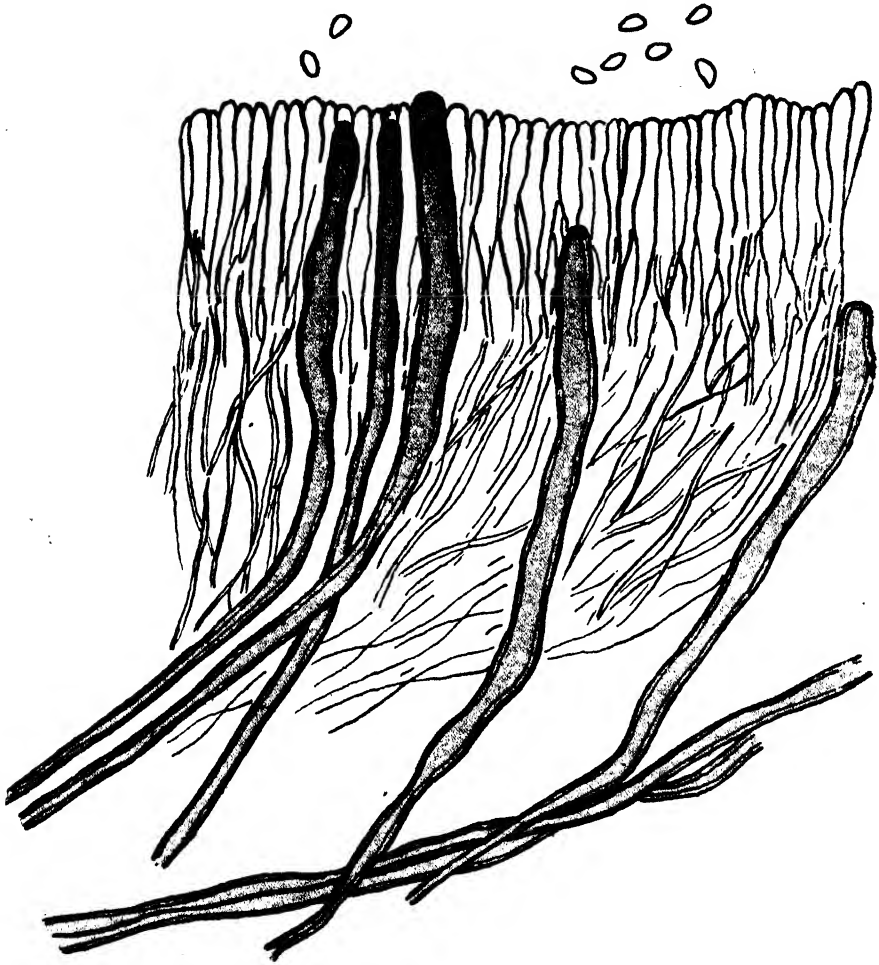


FIG. 5. *Stereum rimosum* var. *africanum*, X 850.

and curving upwards into the hymenium, immersed. *Hyphae* thin-walled, hyaline, often septate, $3.5\ \mu$ wide; width in section—excluding tomentum— $700-1,000\ \mu$. Trama bordered next to the tomentum by a narrow orange-coloured zone. Surface hairs thick-walled, very much tangled, $4.2\ \mu$, almost hyaline to pale yellowish.

Specimens examined: Karkloof, Natal, W. G. Rump 486, 30233, Type in Kew Herbarium with isotype in Pretoria; Donnybrook, Natal, 1936, Morgan and Doidge, 30268; Entabene, Louis Trichardt, 24.8.38, H. C. Bower, 30777; Town Bush, Pietermaritz-

burg, *W. G. Rump* 205, 28285; Houtboschberg, "Tropic of Capricorn, South-East Africa", *W. Nelson* 452, Aug. 1880, in Kew Herb. under *Stereum rugosum*; Uganda, 1915, *T. D. Maitland* 19 A, 1919; *T. D. Maitland* 460.

Compared with Berkeley's type of the species in Kew Herbarium Massee (*Journ. Linn. Soc. Bot.* 27, 1890: 187) quotes the spores of the species as "globose, 6-7 μ diam." I was unable to confirm the presence of such basidiospores though there were numerous globose hyphomycete spores, 4-6.5 μ , echinate, faintly coloured, which were conclusively traced to conidiophores of an *Aspergillus* sp. Should basidiospores of the sort described by Massee be demonstrated, the new variety *africanum* will require to be raised to specific rank. The species and the variety are otherwise identical in microscopic characters. They differ in that the species is more or less pileate or umbonate sessile, while the variety is more resupinate-reflexed and has a far thicker tomentum, and a rougher, more markedly zoned hymenium of lighter colour than the species.

***Grandinia bicolor* Talbot sp. nov.** [Fig. 6.]

Resupinata, effusa, a substrato separabilis, sicca parum fissa; margo siccitate elevatus, definitus, subfuscus, subhirsutus; hymenium pallido-chlorosum, dentibus curtis hemisphaericis vel acutis; contextus coloratus "Prout's Brown"; basidia hyalina, cylindræo-clavata, 14-17 \times 4-5 μ ; sporae hyalinae, laeves, elliptico-cylindræae, plerumque uno latere plano vel depresso, 7-8.5 (-10) \times 2.8-3.5 μ ; hyphae atrobrunneae, crasse tunicatae, 3 μ , basales dense, superiores laxae intertextae; paraphyses pauci ramosi in apicibus dentium interdum adsunt; in trama crystallina mineralia.

Hab. ad ligna, Town Bush, Pietermaritzburg, leg. *W. G. Rump*, 27756.

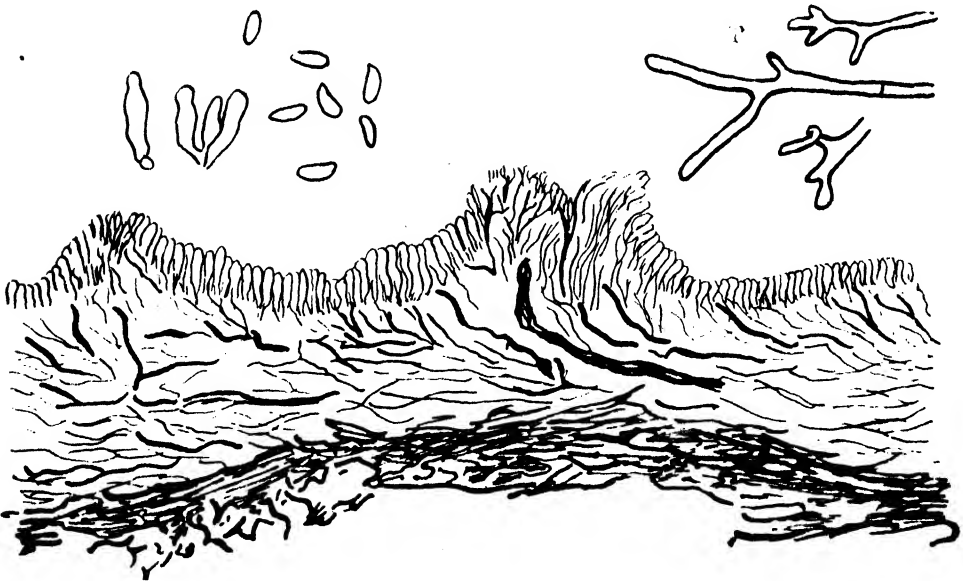


FIG. 6. *Grandinia bicolor*. Basidia and spores X 70. Paraphyses X 700, Section X 125.

Resupinate, effused, cracking but little on drying, separable from substratum; margin lifting on drying, determinate, light brown, pubescent. Hymenium spread over short, densely crowded, hemi-spherical or pointed spines, pallid with a greenish-yellow tint; context Prout's Brown in colour. Basidia hyaline, cylindric-clavate, 14-17 \times 4-5 μ .

Spores hyaline, smooth, elliptic-cylindric, usually with one side depressed, $7-8.5 (-10) \times 2.8-3.5 \mu$. *Hyphae* dark brown, thick-walled, 3μ wide, densely packed adjacent to substratum, extending in a looser horizontal network in the mid-trama and sweeping up vertically into the hymenium; occasionally several hyphae aggregate into a thick cord in the trama. A few branched paraphyses sometimes present at the spines. Mineral crystals are present in trama.

Specimens examined: Town Bush, Pietermaritzburg, W. G. Rump 100, 27756, Type in Kew Herbarium with isotype in Pretoria; from type locality, Rump 270, 28502; Rump 215, 28291; Rump 217, 28292.

***Amauroderma fuscoporia* Wakef., sp. nov.**

Fungus stipitatus, sicco rigidus. Pileus orbicularis, 3-6 cm. diam., convexus, centro umbilicatus, fortiter radiato-rugulosus, pallide cinnamomeus, expallens, zonis obscurioribus concentricis ornatus, margine obtuso, incurvato. Contextus fulvus, 2 mm. crassus, ex hyphis flexuosis, flavidis, laxe intertextis, $2-5 \mu$ diam. compositus. Stipes centralis, laevis, cinnamomeus, sicco rugulosus, basi incrassatus, radicans, 2-2.5 cm. longus, 5-15 mm. latus. Tubuli 2-4 mm. longi, umbrini. Pori c. 4 pro mm., in vivo cinerascens, sicco atrobrunnei. Sporae ovatae vel late ellipsoideae, laeves, pallidae ($10-$) $11-13 \times 9-10 \mu$.

Hab. ad terram, Salisbury, Southern Rhodesia, May 1939, leg. J. C. Hopkins, Myc. Herb., S. Rhod. 4441.

***Fomes zuluensis* Wakef., sp. nov.**

Pileus unguatus, 4.5 cm. longus, 5 cm. latus, postice ad 5.5 cm. elongatus, concentricè zonatus, sulcatus, fuscus, marginem versus spadiceus, minute velutinus, margine rotundato, ferrugineo-fulvo. Tubuli stratosi, fulvidi, 0.5-0.75 cm. longi. Pori minuti, punctiformes, 4-5 pro mm., dissepimentis crassis, cinnamomeis, contextus lignosus, ferrugineo-fulvus. Sporae hyalinae, elongato-ovatae, basi subacutae, $8-10 \times 5 \mu$. Setulae nullae.

Hab. ad lignum, Nkandhla Forest, Zululand, leg. W. G. Rump (374), May 1935, Myc. Herb. Pretoria 30186.

Characterised by the ungulate habit, yellow-brown flesh (Buckthorn Brown-Ridgway) and the large, ovate or pip-shaped hyaline spores.

***Polyporus Doidgeae* Wakef., sp. nov.**

Fungus stipitatus, infundibuliformis. Pileus plus minusve orbicularis, 5-20 cm. diam., centro depresso, primo minute fulvo-velutinus deinde mox glaber, e cinnamomeo rufescens (Ridgway—"Fawn", "Cinnamon-rufous", "Cameo Brown"), margine incurvo, undulato vel lobato. Contextus albidus, mollis 0.3-1 cm. crassus, ex hyphis flexuosis, tenuiter tunicatis, mox collapsis, $3-8 \mu$ diam. compositus. Hyphae cuticulae paullo tenuiores, $2-6 \mu$ diam., flexuosae, vix ramosae, horizontales, extremitatis obtusis, breviter ramosis, primo lanuginem teneram superficialem efficientibus, sed mox evanidis. Stipes centralis vel excentricus, e castaneo fuscus, intus albidus, firmus, sursum incrassatus, $3.5-6 \times 1-3$ cm. Tubuli c. 2 mm. longi, albidii, sicco lignicolores, decurrentes; pori 3-4 pro mm., vel deorsum paulle majores, rotundati vel angulati, interdum elongati, dissepimentis tenuibus laceratis. Sporae ellipticae vel ovatae, hyalinae, laeves, $4-5 \times 2.5-3 \mu$.

Hab. ad lignum Acaciae mollissimae, Hopevale prope Donnybrook, Natal, Feb. 1939, egl. K. E. Morgan, Herb. Myc. Pretoria 30499.

Specimens examined: on stumps of *Acacia mollissima*, Hopevale, near Donnybrook, Polela District, Natal, K. E. Morgan, Feb. 1939, 30499 (type); Feb. 1935, 27753; March 1936, 28576; March 1938, 30776.

The species is very close to *Polyporus virgatus* Berk., and was at first referred to that species. The upper surface of the pileus is, however, not virgate. It appears at first to be covered by a thin brownish tomentum formed by the ends of the hyphae, but this soon disappears and the surface is then quite smooth. The structure of the flesh affords a good distinctive character. In *P. virgatus* the flesh of the cap is firm and is made up of two kinds of hyphae, all rather thick-walled and rigid, some very fine, others much wider but emitting short, fine branchlets at intervals. In the present species the hyphae are all of one kind, loosely interwoven and very little branched, very thin-walled and often collapsed; they form a rather soft, spongy flesh, which absorbs water readily and is probably of a watery consistency when fresh.

I. A REVISION OF THE SOUTH AFRICAN SPECIES OF THE GENUS *TEPHROSIA* PERS.

II. THE SEGREGATION THEREFROM OF THE GENUS *OPHRESTIA* FORBES.

By Helena M. L. Forbes.

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I. THE GENUS *TEPHROSIA*.

Since the South African species of the genus *Tephrosia* were enumerated by Harvey in "Flora Capensis", Vol. 2 (1860-61), a number of new species has been described by different authors, and unnamed material has accumulated in herbaria. This revision, therefore, was undertaken with the object of collating all the previously published descriptions, and of naming and describing any new species found among the unnamed material.

The genus *Tephrosia* belongs to the subsection *Papilionaceae* of the family *Leguminosae*. It was founded by Persoon in 1807, but, as will be seen by the synonymy, *Tephrosia* was not the first name to be given to this group of plants. Murrill in 1910 stated that "according to the Vienna Botanical Conference, the retained and rejected names for this genus are as follows :—

Retained Name.	Rejected Names.
<i>Tephrosia</i> Pers. (1807).....	<i>Cracca</i> L. (1753) ;
	<i>Colinel</i> Adans. (1763) ;
	<i>Needhamia</i> Scop. (1777).

In Kew Bulletin, 1935, p. 416, there is the following note :—

"*Cracca* L. is a nomen rejiciendum *Tephrosia* Pers. being conserved against it. The two are essentially identical, Persoon having transferred to *Tephrosia* all the original species of *Cracca*. It would appear, therefore, that the latter cannot be used under the Rules, but still prevents the use of a later homonym."

The genus is not restricted to South Africa, but occurs throughout the whole of Africa, sub-tropical Australia, America, India and other tropical and semi-tropical parts of the world. It is an extremely variable group, its members ranging from small procumbent plants with tiny insignificant flowers to quite big shrubs with racemes of large mauve-purple flowers. Although the prevailing colour of the flowers varies from a pale pinkish-mauve to rosy or mauve-purple, a few species occur with pale yellow and orange to orange-red flowers. There is one constant and conspicuous character by which the genus may be readily recognized, namely, the close, distinct penninerved venation of the leaflets.

Although it is a large and widely spread group, it is not, as yet, of any economic importance. Some 22 species have been recorded as fish-poison plants, and investigations have been carried out on some of these as to their possible use as insecticides. The principal chemical properties are rotenone, deguelin, tephrosin and toxicarol. Full reports on some of these investigations may be found in Kew Bulletin (1937 and 1940) ; Annals of Applied Biology (1925 ; 1932 and 1934) ; Nature (1936), and Malay Agricultural Journal (1937).

Numerous botanists and travellers have commented on the fish-poison properties of these plants. The four most widely known of these are *T. piscatoria* of India, *T. toxicaria*

of America, *T. Vogelii* of Africa and *T. macropoda* of South Africa. In the case of the first three species the crushed leaves and stems are mainly employed, but in *T. macropoda*, or "iLozane" as the Zulus call it, it is the crushed roots that are used. The method of employment, however, is the same. The crushed material is thrown into a quiet pool or pond, or a part of a river that has been dammed up, and in a short while the stupefied fish rise to the surface of the water, and are thus easily collected. The flesh of the fish is not in any way affected and may be eaten with impunity. The fish, when they rise to the surface of the water, are not actually dead, but in a state of stupefaction or "intoxication", and if, at this stage, they are removed to a pool of fresh water, they will gradually recover. They die, however, if left too long in the treated pool. Writing of *T. Vogelii*, Fairchild stated that men who have waded in streams treated with this plant feel a "kind of deadness" in their legs.

In 1937, R. C. Roarke of the United States Department of Agriculture, published an interesting and comprehensive list of all the literature in which references occur about these plants, either as fish-poisons or insecticides, under the title of "Tephrosia as an Insecticide.—A Review of the Literature." This is not merely a list of publications, but consists of interesting citations from the books as well.

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ABBREVIATIONS.

The following are the abbreviations used when citing specimens deposited in the various herbaria :—

Albany Museum, Grahamstown.....	A.M.
Bolus Herbarium, Cape Town.....	B.H.
Botaniska Museet, Uppsala.....	U.
Botanisches Museum, Berlin-Dahlem.....	B.
Botanisches Museum, Zurich.....	Z.
British Museum (Natural History), London.....	B.M.
Conservatoire Botanique, Geneva.....	G.
Dinter's Private Collection.....	D. Coll.
Fielding Herbarium, Oxford.....	O.
Grey's University College, Bloemfontein.....	G.U.C.
MacGregor Museum, Kimberley.....	Kim.

Museum National d'Histoire Naturelle, Paris.....	Pa.
Natal Herbarium, Durban.....	N.
National Herbarium, Pretoria.....	P.
Naturhistorisches Museum, Vienna.....	V.
Royal Botanic Gardens, Kew.....	K.
South African Museum, Cape Town.....	S.A.M.
South African College, Cape Town.....	S.A.C.
Transvaal Museum, Pretoria.....	T.M.
University of Stellenbosch.....	S.
Witwatersrand University, Johannesburg.....	W.

Tephrosia Pers.

Cracca L. Fl. Zeyl. 139 (1747); Spec. pl. ed. 1 752 (1753); *Erebinthus* Mitch. Acta. Acad. nat. cur. 8 app. 210 (1748); *Colinel* Adans. Fam. 2 (1763); *Needhamia* Scop. Introd. 310 (1777); *Tephrosia* Pers. Synops 11. 328 (1807); *Crafordia* Raf. Specchio. 1. 156 (1814); *Kiesera* Rienw. Sylloge ratisbonn. 2.11 (1828); *Xiphocarpus* C. Presl. Symb. Bot. 1, 13. t. 7. (1830); *Apodynomene* E. Mey. Comment. Pl. Afr. Aust. 111 (1835); *Catacline* Edgew. Journ. As. Soc. Bengal 16, 2. 1314. (1847); *Macronyx* Dalz. Hooker Kew Journ. 2, 35 (1805); *Balboa* Liebn. Kjoebenhaven Vid. Meddel. 106 (1856); *Seemannantha* Alef. Bonplandia 10, 264 (1862); *Benthamantha* Alef. in Bonplandia 10. 264 (1862).

Undershrubs or herbs, stems erect, ascending or procumbent, simple or branched. *Leaves* simple, digitate or pinnate. *Inflorescence* racemose or 1-2 flowers in axils of leaves, racemes terminal, axillary or leaf-opposed; flowers small to large, pale yellow, orange to orange-red, rosy to deep mauve. *Calyx* teeth subequal or longer than the tube; the lower sometimes longer than the rest, linear-lanceolate to subulate; the two upper lobes connate. *Petals* unguiculate; vexillum generally suborbicular and more or less velvety pubescent without; alae obliquely obovate or oblong, adhering a little to the carina, incurved, obtuse or sub-acute. *Stamens*, upper stamen free to the base or middle; anthers uniform. *Ovary* sessile, usually multiovulate. *Style* upcurved, often flattened, naked or bearded; stigma terminal, naked or penicillate. *Pod* linear, flattened, straight or slightly falcate, or plicate or contorted, continuous or slightly septate within.

KEY TO SECTIONS.

Leaves simple.....	SECTION 1.
Leaves palmate or digitate.....	SECTION 2.
Leaves pinnate; stipules setaceous, linear to subulate...	SECTION 3.
Leaves pinnate; stipules broadly ovate or cordate.....	SECTION 4.

KEY TO SECTION 1.

Flowers in a terminal raceme.....	A.
Flowers axillary.....	B.
A. Peduncles 1-2-flowered.....	1. <i>marginella</i> .
Peduncles many-flowered.....	C.
C. Leaves subsessile, all simple.....	2. <i>acaciaefolia</i> .
Leaves petiolate, usually 1-2-jugate, lower occasionally simple..	D.
D. Plant canescent; leaflets oblanceolate, 2-4 cm. long.....	31. <i>griseola</i> .
Plant not canescent; leaflets linear-lanceolate, 4-7-9 cm. long...	39. <i>elongata</i> .
B. Legumes 1-seeded.....	E.
Legumes more than 1-seeded.....	F.
E. Leaves obcordate, up to 2 cm. long.....	3. <i>sphaerosperma</i> .
Leaves ovate-lanceolate, up to 5 cm. long.....	4. <i>pseudosphaerosperma</i> .

- | | |
|---------------------------------------|-------------------------|
| F. Calyx lobes longer than tube..... | 5. <i>Forbesii</i> . |
| Calyx lobes not longer than tube..... | G. |
| G. Leaves sessile..... | 6. <i>virgata</i> . |
| Leaves petiolate..... | H. |
| H. Flowers 1-3 together..... | 8. <i>Pietersii</i> . |
| Flowers solitary..... | I. |
| I. Flowers yellow..... | 9. <i>gracilentia</i> . |
| Flowers mauve..... | 7. <i>monophylla</i> . |

1. ***T. marginella*** H. M. Forbes sp. nov. affinis *T. elongata* E. Mey. habitu minore gracilioreque foliis simplicibus differt.

Caules ascendentes, simplices vel paucae ramosi, sparse appresse pubescentes, fere 33 cm. alti. *Folia* simplicia, lineari-oblonga, 1.5-10 cm. longa, 0.3-1.2 cm. lata, marginibu. crassis; petioli striati, 1.6-3 cm. longi; stipulae lineari-subulatae, 4-5 mm. longae. *Pedunculi* terminales, 1-2-flori, 4.5-20 cm. longi. *Flores* usque ad 1 cm. longae; dentes calycis lineari-subulati tubo subaequilongi vel longiores; stylus glaber. *Fructus* linearis, 4.5 cm. longus, 3 mm. latus.

Type specimen, *Flanagan* 2271, in National Herbarium, Pretoria.

Stems ascending, flexuous, simple or branching a little, slender, thinly appressedly pubescent, up to 33 cm. high. *Leaves* simple, linear to linear-lanceolate, 1.5-10 cm. long, 1.2 cm. broad; glabrous above, thinly appressedly pubescent below, mucronate, margins thickened and straw-coloured, petiole striate, channelled above, sparsely pubescent, 0.6-3 cm. long. *Stipules* linear, 4-5 mm. long; pedicels 3 mm. long. *Calyx*—teeth equalling or longer than the tube; linear-subulate. *Style* glabrous. *Legume* linear, thinly pubescent, 4.5 cm. long, 0.3 cm. broad.

CAPE.—Cathcart district: Mountain above Toise R. Station, *Flanagan* 2271 (P.) Fort Cunyngame, *Sim* 2681 (P.).

This species is similar to *T. elongata* E. Mey, but is a smaller and more slender plant, and the leaves are always simple.

2. ***T. acaciaefolia*** Welw. ex Baker in Oliv. Fl. Trop. Afr. 2, 106 (1871); Baker Leg. Trop. Afr. 180 (1926); Burt Davy Fl. Tvaal. 1, 379 (1932).

Syn. *Cracca acaciaefolia* O. Ktze., Rev. Gen. Pl. 1, 174 (1891); Hiern in Cat. Afr. Pl. Welw. 1, 218 (1896); *Tephrosia salicifolia* Schinz in Viertelsjahrschr. Nat. Ges. Zurich 52, 425 (1907).

Type: *Welwitsch* 2071, in Herbarium, Kew.

Stems erect, ascending, several usually arising from the rootstock, simple or laxly branched, densely grey or ferruginous downy. *Leaves* unifoliate, linear to linear-lanceolate, subsessile, mucronate, apex obtuse, glabrous, grey-downy below and midrib usually ferruginous, 2.5-17.5 cm. long, 0.6-1.9 cm. broad. *Stipules* linear setaceous, 2.5 mm. long. *Peduncles* terminal, 7-36 cm. long, laxly flowered; flowers usually in pairs; pedicels short, downy; bracts setaceous, minute. *Flowers* 1-1.1 cm. long. *Calyx* densely silky without, tube 5-7 mm. in diam., 3 mm. long, lobes subulate, acuminate, shortly and thickly ciliate, unequal, 1.5-3 mm. long. *Vexillum* suborbicular, densely silky without, 0.9-1 cm. long, 8-9 mm. broad; claw 2-3 mm. long. *Ovary* 7-7.5 mm. long, densely silky. *Style* 3 mm. long, somewhat flattened, especially near the base, penicillate at apex. *Legumes* 4-5.5 cm. long, 3 mm. broad, densely grey-silky along middle and dark brown along sutures.

ANGOLA.—At sandy margins of forests between Bumba and Condo, *Wehwitsch* 2071 (K., Pa., G., B.).

TRANSVAAL.—Barberton district: Kaapsche Hoop, *Rogers* 20882 (B.M., P., W.); *Rogers* 20778 (T.M.); Lydenburg district: in grassland at Havelock, *Liebenberg* 2391 (P.). Pretoria district: in grass, Hamanskraal, *Schlechter* 4193 (K., B.M., G., V., Z., B., T.M., B.H., A.M.); Pienaars River, Bushveld, *Rehmann* 4797 (K., B.M., Z.); Elands River and Drift, Bushveld, *Rehmann* 4927 (Z.); Kopjes, Daspoort, *Leendertz* 596 (A.M., T.M.); Rustenburg district: Rustenburg, *Nation* 359 (K., B.H.); *Rogers* 18725 (T.M.); Waterberg district: in collibus lapidosus graminosisque prope Potgietersrust, *Leendertz* (T.M., S.A.M., A.M.); Rooiplaat, *Leendertz* 759 (T.M., B.H.); Vygenboompoort, near Naboomspruit, *van Dam* (T.M.); sandveld, Mosdene, Naboomspruit, *Galpin* M. 86 (P.); Pietersburg district: Between Koedoes and Middel Letaba River, *Junod* 1554 (Z., G.).

3. **T. sphaerosperma** (D.C.) Baker in Oliv. Fl. Trop. Afr. 2. 125 (1871); Engl. Bot. Jahrb. 9.29. (1888); O. Kuntze Rev. Gen. Pl. 1 (1891); Burt Davy and Pott in Ann. Tvl. Mus. 3. 3. 146 (1912); Ann. Bolus Herb. 1. 1. 15 (1914); Ann. S. A. Mus. 9. 4. 256 (1915); Engl. and Drude Die. Veg. der Erde 9. 590. Fig. 292 (1915); Bak. f. Leg. Trop. Afr. 1. 215 (1926).

Syn.—*Requienia sphaerosperma* DC. Ann. Soc. Nat. Ser. 1. IV 91. (1825); Leg. Mem. 6.226 t. 38 (1825); Harvey in Harv. and Sond. Fl. Cap. 2.231 (1861–62); Burt Davy Fl. Tvaal. 1. 2. 379 (1932).

Co-type specimens, *Burke* and *Zeyher* 368, in Herbarium, Kew.

A copiously branched diffuse undershrub. *Stems* numerous, rigid, branching, procumbent or suberect, flexuous, more or less densely grey-pubescent, about 30 cm. long. *Leaves* unifoliate, obovate or orbicular, subobcordate, often complicate, mucro recurved, both surfaces finely grey downy, veins prominent on lower surface, 0.5–12 cm. long, 0.4–1.6 cm. broad; petioles 2–4 mm. long. *Flowers* pale yellow, axillary, very shortly pedicellate, 1–3 together, 3.5–4 mm. long. *Calyx* pubescent, tube 3–3.5 mm. in diam., about 1.5 mm. long, lobes lanceolate, about 0.5–1 mm. long, lowest longest. *Vexillum* obovate, 2–3 mm. long, about 1.5 mm. broad. *Ovary* 2.5 mm. long, pubescent. *Style* about 1 mm. long, incurved, glabrous. *Legume* thinly pubescent, 1-seeded, tapering to the base, 5–8 mm. long, 2.5–3 mm. broad.

SOUTH WEST AFRICA.—Omahekeinsel bei Karibib, *Dinter* 6875 and *Dinter* 6975 (D. Coll.); Palmerswald, *Dinter* 2355 (B.); Giftkoppie, *Dinter* 1432 (Z., B.); Inachab, *Dinter* 1149 (Z.); and *Dinter* 1155 (Z., B.); Oshihoho, *Schinz* 545 (Z., B.H.); Okahandja, sandige Ufer 1300 m. *Dinter* 305 (K., B.M., Z., G., B., S.A.M., A.M.); am sandwege Grotfontein-Grosshuis, *Dinter* 7274 (K., D.Coll.); Namabezirk, Narib sandfelder zuusehen den Dunen der Kalahari-hugel, *Engler* 6553 (B.); Sandboden in Sandverhaar, *Schafer* 279 (B.); sand dunes at Sandverhaar, *Pearson* 4683 (K., B.M., B.H.); and *Pearson* 4915 (K.); Quickborn, Waterberg, *Bradfield* 191 (P.); Mariental, Einup, *Steyn* 22534 (P.); sand dunes between Noachabeb and Grundoon, *Pearson* 7892 (K., B.M., N., A.M., B.H., P., Kim.); Damaraland, *Een* (B.M.); No definite locality, *Dinter* 5153 (D. Coll.); *Dinter* (D. Coll.); *Seiner* 96 (B.).

CAPE.—In arenosis, Kuruman, *Marloth* 1048 (B., P., A.M.); near source of Kuruman River, *Burchell* 2514 (K.); Armoeds Vlakte, Vryburg, *Mogg* 8265 (P.); Griqualand West; between Asbestos Mountains and Wittewater, *Burchell* 1693 (K., B.).

ORANGE FREE STATE.—Kroonstad district: common in grassveld, Bothaville, *Goossens* 1202 (P.).

TRANSVAAL.—In collibus arenosis prope Crocodile and Aapies River, *Zeyher* 368 (K., B.M., Pa., S.A.M.); Vereeniging, *Gilfillan* (B.M.); near Pietersburg, *Schlechter* s.n. (B.) probably Pretoria district, *Rutherford* (K.).

RHODESIA.—Victoria Falls, Schwarz (B.H.).

SOUTH AFRICA.—No definite locality, Burke (K.); Chapman and Baines (K.); Lemue (G.).

4. **T. pseudosphaerosperma** Schinz in Viertelsjahrschr. Nat. Ges. Zurich 57, 557 (1912); Bak. f. Leg. Trop. Afr. 1.215 (1926); Die Veg. der Erde 9.3.591 (1915).

Type specimen, Fleck 334a, in Botanisches Museum, Zurich.

Stems erect or ascending, several arising from the rootstock. Leaves simple, 2–6.5 cm. long, 1–1.5 cm. broad, elliptic to elliptic-lanceolate or elliptic-spathulate, wedge-shaped at base, mucro recurved, densely appressedly sericeous on both sides, petioles about 2–3 mm. long. Stipules subulate, 1–2 mm. long. Flowers axillary, 2–4 together, small; pedicels 1–2 mm. long. Calyx densely sericeous, tube 2–3 mm. long, lobes unequal, 1–2 mm. broad. Ovary 4 mm. long, densely sericeous. Style glabrous, 1.5 mm. long. Legume one-seeded, 0.5–1 cm. long, 2–4 mm. broad, sericeous.

SOUTH WEST AFRICA.—Omalhelhe bei Epasa, Seiner 352 (Z., B.); Karribib, Omalhekernsnel, Dinter 6975 (P.).

BECHUANALAND.—Uschi, Kalahari, Fleck 334a (Z.); Mochudi, Rogers 6591 (K., Z.); Harbor [Rogers 6336] (P.); Harbor [Rogers 6499] (B.H.).

5. **T. Forbesii** Baker in Oliv. Fl. Trop. Afr. 2.116 (1871) in nota; Die Veg. der Erde 9.3.589 (1915); Burt Davy Fl. Tvaal. 1.2.379 (1932); (*T. salicifolia* Schinz, in part.).

Type specimen, Forbes s.n. in Herbarium, Kew.

Perennial. Stems ascending, slender, branching, with short grey or fulvous pubescence. Leaves simple, subsessile, linear, mucronate, apex recurved, glabrous above, pilose below, 2.5–7 cm. long, 0.4–1.1 cm. broad. Stipules setaceous, 3–6 mm. long. Flowers 0.9–1.3 cm. long, pale mauve-pink, solitary or in pairs in the axils of the leaves; pedicels 0.4–1 cm. long. Calyx silky, tube 4–5 mm. in diam., 2 mm. long, lobes linear-subulate, all more or less the same length, 4–7 mm. long. Vexillum suborbicular, silky without, 0.8–1 cm. long, 5–9 mm. broad, claw short, 1–2 mm. long; carina 0.7–1 cm. long, 2–3 mm. broad; alae 0.9–1.1 cm. long, 2–3 mm. broad, with a short tail at the base of each lobe. Ovary 6–7 mm. long, silky. Style 2 mm. long, penicillate. Legume linear, thinly appressedly silky, 2.5–3.5 cm. long, 3–4 mm. broad.

TRANSVAAL.—Waterberg district: in sandveld, Mosdene, Naboomspruit, Galpin 11667. (K., B.H., N., P.); and Galpin M 84 (P.).

PORTUGUESE EAST AFRICA.—Ad sinum Delagoa Bay, Forbes 77 (P.); Delagoa Bay, Forbes s.n. (K.); Junod 168 (G., Z., B.); Rikatla, Lourenço Marques, Junod 546 (T.M.); Lourenço Marques, Schlechter 11519 (K., B.M., G., Pa., V., Z., B.); Howard 25 (B.H.); Borle 585 (P.); sandflats east of docks, Lourenço Marques, van Nouhuys (T.M.).

6. **T. virgata** H. M. Forbes sp. nov., affinis *T. Forbesii* Bak., sed foliis angustioribus, caulibus senicibus multo ligneis differt.

Suffruticosus. Caules novelli tenuiter appresse albo-pubescente, caules senices lignei, subnigri. Folia simplicia, lineari-lanceolata, 1.5–2.5 cm. longa, usque ad 2 mm. lata, mucronata, retusa, parva, supra glabrescentia, subtus appresse pubescentia; stipulae angusto-lineari-subulatae, usque ad 1 mm. longae. Flores axillares, geminati, 4 mm. longi; pedicelli graciles, usque ad 4 mm. longi; lobi calycis pilosi, tubo aequilongi; stylus pilosus. Fructus linearis, complanatus appresse pubescens, 1.5 cm. longus, 3 mm. latus.

Type specimen, *Pole Evans* s.n., in National Herbarium, Pretoria, and Natal Herbarium, Durban.

Small, somewhat shrubby plant. *Stems* when young, slender, appressedly albobescent, when old, woody and almost black in colour. *Leaves* simple, sessile or subsessile, linear-lanceolate, mucro retuse, small, glabrous above, appressedly pubescent below, 1.5–2.5 cm. long, up to 2 mm. broad. *Stipules* narrow, linear-subulate, up to 1 mm. long. *Flowers* axillary, in pairs, 4 mm. long. *Pedicels* slender, 4 mm. long. *Calyx* softly pilose, lobes equalling the tube, ciliate. *Vexillum* 4 mm. long, 3 mm. broad; carina eared at base. *Style* bearded. *Legume* linear, flattened, thinly appressedly pubescent, 1.5 cm. long, 3 mm. broad, 2–4 seeded.

TRANSVAAL.—Greefswald 615, nr. Mapungubwe, *Pole-Evans* (P., N.).

One gathering only of this plant has been seen. The dark woody stems, apparently arising from a woody rootstock, bearing the young leaf- and flowering-stems, make this species quite distinct from any other. The greyish-green leaves and very small pink-mauve flowers tend to make the plant inconspicuous. From its appearance this plant probably grows in very arid regions.

7. **T. monophylla** Schinz in Viertelsjahrsch. Nat. Ges. Zurich, 52. 424 (1907).

Type specimen, *Fleck* 836, in Botanisches Museum, Zurich.

Stems erect, slender, densely appressedly argenteo-sericeous. *Leaves* shortly petiolate, unifoliate, oblong-elliptic, mucronulate, glabrous above, sericeous below, 1.5–5.5 cm. long, 3–8 mm. broad; petioles 4–6 mm. long. *Stipules* up to 2 mm. long. *Flowers* solitary, axillary, on pedicels up to 2 cm. long. *Calyx*-tube 3 mm. long, 5 mm. in diam., two upper lobes short, connate, lateral and lowest lobes approximately 2 mm. long. *Vexillum* 1–1.2 cm. long, 4–5 mm. broad. *Ovary* 5 mm. long, pilose. *Style* 1–1.5 mm. long, glabrous. *Legumes* up to 4 cm. long, 4 mm. broad, slightly falcate, appressedly argenteo-sericeous.

SOUTH WEST AFRICA.—Rehoboth, *Fleck* 836 (Z.); Hereroland, *Fleck* 436 (Z.); Sandibenen bei Inachab, *Dinter* 1158 (Z.); Usakos, *Dinter* 5927 and *Dinter* s.n. (D. Coll.); Karibib, *Dinter* 778 (D. Coll.); Grosser Kalkber, *Dinter* 7703 (B., D. Coll.).

8. **T. Pietersii** H. M. Forbes sp. nov., affinis *T. Forbesii* Bak., sed foliis pedicellisque longioribus differt.

Caulis gracilis, ascendens, simplex vel parce ramosus. *Folia* simplicia, lineari-lanceolata, 2.8–7 cm. longa, 3–7 mm. lata; mucronata, mucrone retuso, supra glabrescentia, subtus appresse pilosa; petioli graciles, 0.3–1.2 cm. longi; stipulae angusto-subulatae, 2–5 mm. longae, pubescentes. *Flores* axillares, solitarii vel terni, purpurei, 0.9–1.2 cm. longi; pedicelli 4–5.5 mm. longi; lobi calycis lineari-subulati, pilosi, ciliati, tubo aequilongi vel breviores; stylus glaber. *Fructus* 2–3 cm. longus, 3 mm. latus, leviter falcatus, pubescens.

NATAL.—Ladysmith district: near Pieters, 3–4000 ft., 1900, *Wood* in Natal Herb. 8888, Type.

Stems slender, ascending, simple or laxly branched, 1–4 arising from the rootstock, up to 10 cm. long. *Leaves* unifoliate, linear-lanceolate, slightly falcate, mucro short, recurved, glabrescent above, thinly appressedly pilose beneath, 2.8–7 cm. long; petioles slender, 0.3–1.2 cm. long, with two small bracts 1–1.5 mm. long at apex. *Stipules* narrow subulate, pubescent, 2–5 mm. long. *Flowers* axillary, solitary or three together, purple, 0.9–1.2 cm. long; pedicels 4–5.5 mm. long. *Calyx* pilose, tube 5 mm. in diam., lobes unequal, lateral and lowest longest. *Vexillum* silky without, 0.9–1.2 cm. long, 4–7 mm. broad; *alae* 1–1.2 cm. long, 2.5 mm. broad, sparsely pilose without and ciliate, especially

towards base of lobe; parina 6.5-7.5 mm. long, 2 mm. broad. *Staminal-tube* 5.5 mm. long, vexillary stamen attached. *Ovary* silky, 5 mm. long. *Style* 2 mm. long, glabrous. *Legume* slightly falcate, pubescent, 2-3 cm. long, 3 mm. broad.

9. **T. gracilentia** H. M. Forbes sp. nov., affinis *T. Pietersii* H. M. Forbes, sed caulibus gracilioribus, foliis brevioribus angustioribusque, floribus flavidis differt.

Caules graciles, ascendentes. *Folia* simplicia, lineari-lanceolata, 2.3-3.9 cm. longa, 2.5-5 mm. lata, subtus appresse pilosa, supra glabrescentia, apice retusa, mucrone parvo; petioli 2.5-6 mm. longi; stipulae setosae, 2-3.5 mm. longae. *Flores* axillares, solitarii, flavi; pedicelli 5.5 mm. longi; dentes calycis tubo breviores; stylus glaber. *Fructus* non visus.

NATAL.—Entabeni district: Gingindhlovu, 1933, *Gerstner* in Natal Herb. 23083, Type.

Stems slender, ascending, thinly appressedly pilose becoming glabrous when older. *Leaves* unifoliolate, linear-lanceolate, appressedly pilose below, glabrous above, mucro small, recurved, 2.3-3.9 cm. long, 2.5-5 mm. broad; petioles 2.5-6 mm. long, with two small bracts at apex. *Stipules* setaceous, 2-3.5 mm. long. *Flowers* yellow, solitary in axils of leaves, 1-1.5 cm. long; pedicels 5.5 mm. long. *Calyx-tube* 5 mm. in diam., 2.5 mm. long, lobes ciliate, shorter than the tube. *Vexillum* silky without and long ciliate round margin at base of lobe. *Ovary* densely silky, 5 mm. long. *Style* glabrous, about 1 mm. long. *Legume* not seen.

KEY TO SECTION 2.

- | | |
|--|--------------------------|
| Leaves palmate, 4-7-lobed..... | 10. <i>lupinifolia</i> . |
| Leaves digitate, 3-lobed..... A. | |
| A. Pods flat; leaves generally 2-3-jugate..... | 65. <i>macropoda</i> . |
| Pods not flat; leaves always 3-lobed..... B. | |
| B. Pods twisted into loose spiral..... | 12. <i>contorta</i> . |
| Pods plicately folded..... | 11. <i>plicata</i> . |

10. **T. lupinifolia** (Burch.) DC. Prodr. 2.255 (1825); Linnaea 23. 31 (1850); Harvey in Harv. and Sond. Fl. Cap. 2.204 (1861-62); Baker in Oliv. Fl. Trop. Afr. 2.107 (1871); O. Kuntze Rev. Gen. Pl. 1.175 (1891); Durand and Schinz Etudes sur la Fl. du Congo. 105 (1896); Durand Syll. Fl. Congo. 132 (1909); Burt Davy and Pott in Ann. Tvl. Mus. 3.3.146 (1912); Fries in von Rosen. Schwed. Rhod.-Congo Exped. 1911-12, 1.81 (1914); Die Veg. der Erde, 9, 3.586 (1915); Trans. Roy. Soc. S.A. 5, 4.375 (1916); De Wild in Bull. Soc. Bot. Belg. 577, 2.122 (1925); Bak. f. Leg. Trop. Afr. 1.183 (1926); Bot. Survey Springbok Flats, Mem. 12, 68 (1928); Hutch. and Dalziel Fl. West Trop. Afr. 1, 2.385 (1928); Young in Ann. Tvl. Mus. 14, 4.398 (1932); Burt Davy Fl. Tvaal. 1.9, 378 (1932); Watt and Breyer-Brandwijk Med. and Pois. Pl. S.A. 74 (1932).

Syn. *Galega lupinifolia* Burch. in DC. Prodr. 2.255 (1825); *Rhynchosia* (*Polytropia*) Cienkowski Schweinf. Reliq. Kotschy. p. 31, t. 24-5 (1868); *Cracca lupinifolia* O. Ktz. Rev. Gen. Pl. 1.175 (1891); Hiern in Cat., Afr. Pl. Welw. 1.219 (1896).

Type specimen, *Burchell* 2488, in Herbarium, Kew.

Suffruticose. *Stems* diffuse, with stems, petioles, peduncles and young leaves roughly fulvo-hirsute. *Leaves* 4-5 foliolate, palmate; leaflets 1.5-8.5 cm. long, 0.4-1.8 cm. broad, oblanceolate, mucronate, apex recurved, margin thickened, glabrous or sparsely hirsute above, fulvo-hirsute beneath; petioles 1-8.5 cm. long. *Stipules* short, broadly subulate, ribbed, 2-5 mm. long. *Peduncles* terminal and axillary, 9-26 cm. long, laxly flowered. *Flowers* small, 5-7 mm. long, in fascicles of 2-3; pedicels 3-7 mm. long. *Calyx*

2.5-5 mm. long, pilose, lobes subequal, lanceolate, acuminate, 1.5-3 mm. long. *Vexillum* sericeous without, subrotund, about twice as long as the calyx. *Ovary* appressedly villous. *Style* short, glabrous. *Legume* linear, flat, pubescent, 2.5-3.5 cm. long, 3-5 mm. broad.

SOUTH WEST AFRICA.—Between Kunene River and Eunda, *Barnard* 780 (S.A.M.); Bushveld, Grasslippe uber Lehm, *Dinter* 2327 (B.); Okandjose, *Dinter* 528 (Z.); Ambo-land, Onamakunde, *Rautanen* 20 (B.); Omnlonga, *Schinz* 2086 (Z.); Oshiheke, *Schinz* 2087 (Z.); Otyvaronga district, Quickborn, Okohandja, *Bradfield* 359 (P., T.M.); Damara-land: Olukonda, *Rautanen* 512 (Z.); Ondonga, Olukonda, *Rautanen* 514 (Z., G.); *Rautanen* 517 (Z.); No definite locality, *Rautanen* 513 (K., Z., V., G.).

CAPE.—Little Klobbokhonni near Harnapery, *Burchell* 2488 (K., G.); Mochudi, *Harbor* 6498 in Herb. Rogers (B.H.). Kuruman district: in arenosis, Marmosis, Kuruman, *Marloth* 1047 (P.); Vryburg district: Grasfort, Vryburg, *Mogg* 8333 (P.); Biesjesvlakte, Vryburg, *Henrici* 67 (P.); Vryburg, *Burt Davy* 11111 (P.); East Griqualand in arenosis pr. Botsabelo, *Schlechter* 4101 (Z., B., G.H.).

ORANGE FREE STATE.—Bothaville, Kroonstad, *Goossens* 1165 (P.).

TRANSVAAL.—Potchefstroom district: Vaal and Mooi Rivers, *Burke* and *Zeyher* 343 (K., B.M., S.A.M.); Vereeniging district: Vereeniging, *Gilfillan* (P.); Witwatersrand district: grass veld, Canada, near Johannesburg, *Moss* 13603 (W.); Lichtenburg district: Lichtenburg, *Jenkins* (T.M.); townlands, Klipveld, Lichtenburg, *Liebenberg* 69 (P.); Barberton district: Research Station, Nelspruit, *Liebenberg* 2447 (P.); Carolina district: Waterval Boven, *Rogers* [T.M. 14875] (T.M.); *Rogers* 18408 (Z.); Middelburg district: Witbank, *Rand* 142 (B.M.); Pretoria district: T.U.C. Farm, Pretoria, *Moss* 8489 (B.M., W.); road to Daspoort, *Leerdertz* 579 (B.H., T.M.); Wonderboom, *Smith* 2268 (P.); between station and level crossing, Wonderboom, *Smith* 6243 (P.); Wonderboompoort, *Rehmann* 4607; (Z.); Magaliesberg near Wonderboom, *Burt Davy* 2659 (P., B.H.); between Bronkhorstspuit and Middelburg, *Wilms* 361 (B.M., G., B.); Middelkop near Pienaars River, *Smith* 2155 (P.); near Koedoespoort, *Smith* 1534 (P.); Bushveld near Eland River and Klippan, *Rehmann* 5032 (K., B.M., Z.); Aapies and Vaal Rivers, *Burchell* 2270 (K.P.); *Burke* 343 (Z.); Vaal River, *Burke* (Pa.); Waterberg district: Strydpoort, Makapaans-berge, *Rehmann* 5550 (Z., B.); Mosdene, Naboomspruit, *Galpin* M. 81 (P., Z.M.); Rusten-burg district: Rustenburg, *McClelland* (G.U.C.); Marico district: Zeerust, *Burt Davy* 7191 (P.); district unknown: in arenosis pr. Mordiniobole, *Schlechter* 4262 (K., B.M., G., V., Z., B., T.M., A.M.); Zandrivierspoot, *Rogers* 24961 (Z., T.M.); Kalahari Region, *Maclea* 6074 (B.H.).

SOUTHERN RHODESIA.—Bulawayo district: Matopos, *Rogers* 5682 (T.M., S.A.M., B.H.); Eyles 1154 (Pa., Z., S.A.M.); Victoria Falls, *Rogers* 5605 (Z.); *Fries* 20 (Z.); *Flanagan* 3127 (B.H.); south bank of Zambesi, Victoria Falls, *Rogers* 5716 (K., B.H.).

NORTHERN RHODESIA.—Barotseland, *Watt* and *Brandwyk* 286 (P.).

ANGOLA.—*Welwitsch* 2076 (P., G.); *Welwitsch* 2077 (G., B.); *Gossweiler* 365 (B.).

SOUTH AFRICA.—No definite localities, *Zeyher* 457 (B.M.); Cape (?) 1850, *Zeyher* 458a (K., B.M., Pa., G., Z., B., S.A.M.); Drège 458 (V.); *Burchell* 2527 (K.); 1846 Lemuë (G.).

This plant is known as "namiyati" to certain native tribes, and a preparation of the root is used by them for procuring abortion and for committing suicide.

11. **T. plicata** Oliv. in Hook. Ic. Pl. t. 1445 (1883); Wood Fl. of Natal 342 (1907); Wood in Trans. S.A. Phil. Soc. 18.2. 147 (1908); Burt Davy and Pott in Ann. Tvl. Mus. 3.146 (1912); Bews Fl. Natal and Zululand 111 (1921); Bot. Survey S.A. Mem. 12.68 (1928); Burt Davy Fl. Tvaal. 1.7.378 (1932).

Syn. *Ptycholobium plicatum* (Oliv.) Harms in Engl. Pflanzenw. Afr. 3.1. (1915); Engl. and Drude, Veg. der Erde 9.591 (1915) in obs.

Type specimen, *Rehmann* 4922, in Herbarium, Kew.

Suffruticose, 15–30 cm. high. *Stems* rigid, diffusely hirtotomentellous, procumbent or ascending. *Leaves* trifoliolate, shortly petiolate; leaflets rigid, narrow oblanceolate, apex mucronate, recurved, glabrous above, pubescent below, 0.9–4 cm. long, 0.2–1 cm. broad; petioles 2–7 mm. long. *Stipules* subulate, 1–3 mm. long. *Flowers* minute, 6 mm. long, axillary, subsessile, often geminate. *Calyx*-tube 2 mm. long, 3–5 mm. in diam., lobes about 2 mm. long, lanceolate, acute. *Vexillum* obovate, subpanduriform, retuse, unguiculate, appressedly pubescent without, 6 mm. long, 3 mm. broad; alae ciliate round lower part of lobe. *Ovary* pilose, 3–4 mm. long. *Style* about 1 mm. long, glabrous. *Legume* 0.9–1.3 cm. long, 5 mm. broad, abruptly transversely 3–5 plicate.

ZULULAND.—No definite locality, *Gerrard* 1087 (K.).

TRANSVAAL.—Barberton district: Berea, Barberton, *Thorncroft* 111 (K., P.); *Thorncroft* 884 (N., V.); *Rogers* 18544 (P.); *Pott* 5349 (T.M.); Kaapmuiden, *Rogers* 25075 (G., Z., T.M.); Pretoria district: Elands River and Drift, Bushveld, *Rehmann* 4922 (K., Z.); *Rehmann* 5181 (Z., B.); in graminosis pr. Pienaars River Bridge, *Schlechter* 4212 (K., Z., V., G., B., B.H., A.M., T.M.); Onderstepoort, *Theiler* (T.M.); near Cheop Pyramid, *Mogg* 1241 (P.); Rooikop, Bushveld, *Smuts* and *Gillett* 2125 (P.); Rust der Winter, *Pole-Evans* 3879 (P.); Waterberg district: Sandveld, Mosdene, Naboomspruit, *Galpin* M.90 (P.); Sandrivierspoort, *Rogers* 24976 (B.M., P.); Pietersburg district: Sand River, *Murray* 610 (P.); Zoutpansberg district: Mara, *Rogers* 22271 (P., T.M.).

PORTUGUESE EAST AFRICA.—Ressano Garcia, *Schlechter* 11830 (K., G., A., B.).

12. ***T. contorta*** N.E. Br. in Kew Bull. 103 (1909); Engl. in Engl. and Drude Veg. der Erde 9.3.1. 568 (1915).

Syn. *Sylitra contorta* (N.E. Br.) Bak. f. Leg. Trop. Afr. 1. 268 (1926); *Bothalia* 3.2.239 (1937).

Type specimen, *Lugard* 132, in Herbarium, Kew.

A shrub with straight twig-like branches, whole plant densely albo-tomentose. *Leaves* trifoliolate, petiolate; leaflets 1.5–4 cm. long, 0.6–1.2 cm. broad, cuneate-oblong, obtuse, mucro recurved, glabrous above, pubescent beneath with adpressed silky white hairs, medial leaflet longest. *Stipules* 2–4 mm. long. *Flowers* axillary, small, fasciculate, 3–4 together, 7–8 mm. long. *Calyx* villous, tube 4 mm. in diam., 2 mm. long, teeth subulate, three equal in length to the tube, two upper shorter and slightly connate. *Vexillum* 6–7 mm. long, 2–3 mm. broad, pubescent on the back. *Ovary* densely villous-tomentose, 2.5–4 mm. long. *Style* slender, glabrous. *Mature legumes* twisted into a loose spiral, densely villous-tomentose with white hairs.

BECHUANALAND.—Ngamiland, Kwebe, *Lugard* 132 (K.).

TRANSVAAL.—Zoutpansberg district: Messina, *Rogers* 20042 (K., G., P., Z.); *Rogers* 20812 (N., P., W.); *Pole-Evans* 1718 (P.); between Saltpan and Waterpoort, Zoutpansberg, *Obermeyer*, *Schweickerdt* and *Verdoorn* 267 (P.); near Catophractes belt, Zoutpan, *Schweickerdt* and *Verdoorn* 508 (P.); Zoekmakaar, Pietersburg, *Rogers* 22598 (Z., P.); Lydenburg district: Ohrigstad-Branddraai Road, *Young* A583 (T. M.); Sandrivier, *Schlechter* 4592 (B., B.H.).

This plant is very closely allied to *T. plicata* Oliv., but the legumes are spirally twisted instead of plicately folded.

Baker f. Leg. Trop. Afr. p. 168 suggests that Fig. 290 in Engl. Veg. der Erde is *T. contorta* N.E. Br., but in my opinion this figure is typical *Sylitra contorta* E. Mey. Engler's sug-

gestion that *T. contorta* N.E. Br. perhaps belongs to the genus *Sylitra* is also incorrect. One of the main differences between the two genera (*Tephrosia* and *Sylitra*) is the pod, which in the latter genus is of a thin papery texture. In *T. contorta* the pods are of a much firmer texture and are also much more contorted than those of *Sylitra*.

KEY TO SECTION 3.

- Stems erect..... A.
 Stems procumbent, spreading or ascending..... B.
- A. Stipules subulate..... C.
 Stipules linear, setaceous or lanceolate..... D.
- C. Whole plant densely silvery canescent..... 13. *canescens*.
 Whole plant not densely silvery canescent..... E.
- E. Flowers in axils of upper leaves, or few on short terminal peduncles up to 2.5 cm. long..... 14. *stricta*.
 Flowers on terminal, axillary or leaf-opposed peduncles..... F.
- F. Pubescence on stems, etc., yellow or brown..... G.
 Pubescence on stems, etc., greyish..... H.
- G. Stems, etc., with close or spreading yellowish pubescence..... 15. *polystachya*.
 Stems, etc., with short ascending brown hairs..... 16. *noctiflora*.
- H. Peduncles terminal and leaf-opposed..... I.
 Peduncles terminal and axillary..... J.
- I. Leaves 2-4-jugate, leaflets linear-lanceolate; pods pale yellow-green..... 17. *Dregeana*.
 Leaves 3-8-jugate; pods not pale yellow-green..... K.
- K. Leaflets cuneate-oblong, dark green above, pale green below; pods linear, velvety..... 18. *pallens*.
 Leaflets oblanceolate; pods slightly falcate, thinly pubescent..... 19. *delagoensis*.
- J. Leaves 1-6-jugate; leaflets more or less densely canescent below..... 22. *discolor*.
 Leaves not-canescant below..... L.
- L. Leaves 7-9 jugate; peduncles laxly racemose..... 20. *amoena*.
 Leaves 4-8-jugate; peduncles few flowered at apex..... 21. *Medleyi*.
- D. Style glabrous..... M.
 Style bearded or penicillate at apex..... N.
- M. Stems, etc., densely cano-pubescent..... O.
 Stems, etc., yellow, brown or grey pubescent..... P.
- O. Leaves 2-6-jugate; leaflets up to 3 cm. long, cano-pubescent on both sides..... 23. *euchroa*.
 Leaves 5-9-jugate; leaflets up to 1.8 cm. long, glabrous and pale green above, densely canescent below..... 24. *pallida*.
- P. Pubescence grey..... Q.
 Pubescence yellow or brown..... R.
- Q. Leaves 6-12-jugate; leaflets complicate; peduncles laxly many flowered..... 25. *Kraussiana*.
 Leaves 3-5-jugate; leaflets not complicate; peduncles sparsely flowered..... 26. *sparsiflora*.
- R. Leaves 5-17-jugate; stipules 4-6 mm. long..... 27. *polystachyoides*.
 Leaves 5-9-jugate; stipules up to 1 cm. long..... 28. *Ehrenbergiana*.
- N. Style penicillate at apex..... S.
 Style bearded..... T.
- S. Veining on lower surface of leaflets dark brown..... 29. *oxygona*.
 Veining on lower surface of leaflets not dark..... U.
- U. Peduncles densely many flowered..... 30. *zoutpansbergensis*.
 Peduncles laxly flowered..... V.
- V. Leaves 1-2-jugate, sometimes simple..... 31. *griseola*.
 Leaves 3-17-jugate, never simple..... W.
- W. Leaves 7-17-jugate; leaflets up to 2 cm. broad..... 32. *purpurea*.
 Leaves 3-9-jugate; leaflets rarely 1 cm. broad..... X.
- X. Leaves 6-9-jugate; leaflets up to 9 mm. broad, oblanceolate..... 33. *Evansii*.
 Leaves 3-8-jugate; leaflets up to 6 mm. broad, narrow oblanceolate..... 34. *transvaalensis*.

- T. Peduncles up to 7 cm. long, flowers few in a short dense raceme... 35. *inandensis*.
 Peduncles 8-31 cm. long, laxly many flowered.....Y.
- Y. Leaves 3-8 jugate; peduncles 10-15 cm. long..... 36. *otaviensis*.
 Leaves 7-14 jugate; peduncles 8-31 cm. long..... 37. *lactea*.
- B. Stipules setaceous, linear or linear-lanceolate.....(a)
 Stipules subulate.....(b).
- (a) Stems ascending.....(c).
 Stems procumbent or trailing.....(d).
- (c) Leaves sessile or subsessile..... 38. *izaneensis*.
 Leaves distinctly petioled.....(e).
- (e) Style glabrous; leaves 1-2 jugate..... 39. *elongata*.
 Style bearded; leaves 1-8 jugate.....(f).
- (f) Leaflets narrow linear-lanceolate, 2-4 mm. broad..... 40. *angustissima*.
 Leaflets linear-lanceolate, up to 9 mm. broad.....(g).
- (g) Leaves 1-4 jugate; midrib lutescent, prominent on lower surface
 of leaflets..... 41. *lurida*.
 Leaves 2-8 jugate; leaflets argenteous below (lfts uncinata in var.
 uncinata)..... 42. *longipes*.
- (d) Style penicillate; veining dark reddish-brown on lower surface
 of leaflets..... 43. *multijuga*.
 Style glabrous; veining not dark.....(k).
- (h) Whole plant more or less densely rufo-tomentose; leaflets glabrous
 above..... 44. *semiglabra*.
 Plant hirsute with long whitish hairs; leaflets glaucous above.... 45. *Burchellii*.
- (b) Stipules up to 6 mm. long.....(i).
 Stipules 1-2 cm. long.....(j).
- (i) Leaves 3-7 jugate, subsessile; apex of leaflets very retuse..... 46. *retusa*.
 Leaves 2-4 jugate, long-petioled; apex of leaflets obtuse or acute 47. *capensis*.
- (j) Flowers almost capitate in a short dense raceme at apex of ped-
 uncule; calyx lobes short, triangular-subulate..... 48. *pseudocapitata*.
 Flowers in an interrupted raceme or few at apex; calyx teeth
 lanceolate.....(k).
- (k) Apices of leaflets truncate or emarginate; calyx lobes longer
 than tube..... 49. *natalensis*.
 Apices of leaflets apiculate; calyx lobes equal to tube..... 50. *apiculata*.

13. **T. canescens** E. Mey. Comm. Pl. Afr. Aust. 1.1.109 (1836); Hook. Lond. Jcurn. Bot. 2.88 (1834); Cape Plants, Krauss and Engler 54 (1846); Harvey in Harv. and Sond. Fl. Cap. 2.204 (1861-62); O. Kuntze Rev. Gen. Pl. 1.174 (1891); Wood. Fl. of Natal 41 (1907); Wood in Trans. S.A. Phil. Soc. 18.2.147 (1908); Bews Fl. Natal and Zululand 110 (1921); Bak. f. Leg. Trop. Afr. 1.188 (1926); Henkel, Ballenden and Bayer Ann. Nat. Mus. 8.1.106 (1936).

Type specimen, *Drège* s.n. in Botanisches Museum, Berlin-Dahlem.

Suffruticose, erect, whole plant densely silky and silvery canescent, 60-95 cm. high. Stems slender, flexuous, terete, branching a little. Leaves 4-8 jugate, 3.5-10.5 cm. long petiolate; leaflets petiolulate, 0.9-3 cm. long, 0.35-1.3 cm. broad, obovate-oblong, obtuse or emarginate, densely canescent on both sides. Stipules 1-2 mm. long, subulate. Peduncles 2-15 cm. long, racemes many-flowered, leaf-opposed. Flowers 0.9-1 cm. long, pink-mauve; pedicels 3-6 mm. long. Calyx canescent, tube 6-7 mm. in diam., 2 mm. long. Ovary 5-6 mm. long, silky canescent. Style glabrous, 2.5-3 mm. long. Legume 4-5 cm. long, 5-6 mm. broad, 4-6 seeded, canescent.

NATAL.—Durban, Cooper 2200 (K.); Wilms 1952 (K., B.M.); Wood 11836 (Z., P., N., W.); Moss 5307 (B.M., W.); open dune scrub, Moss 5306 (W.); Wood 8753 (N.); Rehmann 8692 (Z.); in frutice ad oram pr. Durban, Wood 6270 (B.M., B., Pa., B.H., P., T.M.); Wood 8046 (B.); Snell Parade, Beach, Durban, van Nieuhuys (N., T.M.); sandy places near Omsamculo, *Drège* (B.); no definite locality, *Drège* (K., B.M., V.); Gerrard

and *McKen* 5 (N.); sand dunes, Beach Terminus, 1913, *Thode* (S.); and 1914 *Thode* (B., S.); Zululand Umlalaas, *Gerstner* (N.); no definite locality, *Gerrard* and *McKen* 222 (K., B.M., Pa., V.).

PORTUGUESE EAST AFRICA.—Delagoa Bay, *Forbes* (K., Pa.); in dunes, *Schlechter* 11987 (K., B.M., B., Pa., A., V., G.); *Wilmer* 306 (B.); Lourenço Marques, *Rogers* 11819 (K., B.M., Z., W., A.M.); *Rogers* 2247 (P., W., T.M.); *Junod* 215 (T.M.); *Borle* 423 (P.); near sea, Catemba, Lourenço Marques, *Borle* 450 (P.); *Muir* 478 (N.); Beira, *Dummer* 669 (K.); *Rogers* 4567 (B.M., Z., B.H., T.M.).

This small shrub occurs on the sand dunes along the Natal coast, extending to Zululand and up the East Coast to Beira. It is an attractive plant, especially when in bloom, for the bright pinky-mauve flowers contrast well with the silvery-white leaves and stems.

14. *T. stricta* (L.f.) Pers. Syn. 2.329 (1807); DC. Prod. 2.253 (1825); Spreng. Syst. Veg. 3.233 (1826); Ecklon and Zeyher Enum. Pl. Afr. Aust. Extratrop. 246 (1825); Harvey in Harv. and Sond. Fl. Cap. 2.205 (1861-62).

Syn. *Galega stricta* Ait. Hort. Kew. 3.70 (1789); Linn. Syst. Nat. ed. 13 per Gmelin 2.2.1130 (1792); Thunb. Prodr. 133 (1800) (sphalm. striata); Willd. Sp. Pl. 3.2.1244 (1803) (sphalm. Galega). *Galega pulchella* Scopol. Delic. Insub. 1.3. t. 2 (1786); Vahl. Symb. 2.85 (1791). *Galega mucronata* Thunb. Prodr. 134 (1800). *Indigofera stricta* L.f. Suppl. 334 (1781); Linn. Syst. ed. Murray 678 (1784); Linn. Syst. Nat. ed. 13 per Gmelin 2.2.1129 (1792); Jacq. Hort. Schroenbr. 2.58 t. 236 (1797); Thunb. Prodr. 133 (1800); Willd. Sp. Pl. 3.2.1232 (1803); Spreng. Syst. Veg. 3.276 (1826).

Type specimen, *Ecklon* and *Zeyher* 1630, is deposited in the Thunberg Herbarium, Uppsala.

Suffruticose. Stems erect, branching, terete, clothed with cinereous tomentum. Leaves subsessile, 2-6-jugate. Leaflets 0.7-1.3 cm. long, 3-5 mm. broad, oblong or cuneate, mucronate, mucro recurved, glabrous above, pubescent below. Stipules 4-6 mm. long, subulate. Flowers few, almost sessile in axils of upper leaves, or occasionally a few borne on a short peduncle about 2.5 cm. long. Pods 2.7-4 cm. long, 4 mm. broad, velvety when young, at length glabrescent.

CAPE.—Swellendam district: on plains of George and Swellendam, *Bowie* 5 (B.M.); Riversdale district: *Burchell* 6728 (K.); George district: on the plains of Outeniqua, *Bowie* 3 (B.M.); Uitenhage district: inter frutices (alt. 111) collium prope Van Stadens rivier and in Olifantshoek, *Ecklon* and *Zeyher* 1630 (K., Pa., G., V., B., U., S.A.M.). No definite locality: *Derraux* (G.); Cape 1772, *Oldenburg* 1103 (B.M.); *Masson* (B.M.).

15. *T. polystachya* E. Mey. in Comm. Pl. Afr. Aust. 10 (1836); Harvey in Harv. and Sond. Fl. Cap. 2.206 (1861-62); O. Kuntze Rev. Gen. Pl. 1.175 (1891); Xalbh. Ann. K.K. Natuurhist. Hofmus. 20.3.24 (1905); Wood Fl. of Natal 42 (1907); Wood in Trans. S.A. Phil. Soc. 18.2.147 (1908); Burt Davy and Pott in Ann. Tvl. Mus. 3, 3.146 (1912); Phillips in Ann. S.A. Mus. 16.1.82 (1917); Bews Fl. Natal and Zululand 111 (1921).

Type specimen, *Drège* s.n. (5462 in Herb. E. Meyer), in Museum, Berlin-Dahlem.

Suffruticose, erect. Stems slender, straight, angular, rib-striate, clothed with close or spreading yellowish pubescence. Leaves shortly petioled, 3-9-jugate, 3-8.5 cm. long; leaflets cuneate-oblong, mucronate, flat or complicate, thinly pubescent above, more densely below, 0.7-3 cm. long, 3.5-9 mm. broad. Stipules subulate, 0.5-1 cm. long. Peduncles terminal and axillary, laxly racemose and many-flowered, up to 27 cm. long. Flowers 1-1.2 cm. long; pedicels 4-6 mm. long. Calyx-tube 3 mm. long, lobes ovate-acuminate, slightly shorter or equalling or exceeding the tube in length. Vexillum 1-1.1 cm.

long and broad, densely hairy without. Ovary densely long hairy. Style glabrous. Legumes narrow, linear or slightly curved, pubescent, 3.5–4 cm. long, 3 mm. broad.

CAPE.—Stockenstroom district: edge of forest, Bergmans Kloof, Stockenstroom, *Scully* 205 (P.); Queenstown district: Mountains, Queenstown, *Galpin* 1757 (B.); grassy slopes, Lesseyton Nek, *Galpin* 1952 (K., A.M., P., B.H.); Bongola Dam, Abrahams, *Moss* 13237 (W.); Umtata district: in collibus pr. Umtata, *Schlechter* 6335 (B., A.M., B.H.); near Umtata, *Flanagan* 2853 (S.A.M.); *Boius* 8878 (B.H., S.); Baziza, Tembuland, *Baur* 77 (K., B., A.M., S.A.M., B.H.); inter Gekau and Bashee, *Drège* s.n. (K., B.); Omsamcaba, Pondoland, *Drège* s.n. (K., B.M., B.); Kreilis Country, Kafraria, *Bowker* (K.); no definite locality, *Drège* in Herb. E. Meyer 5460, 5461, 5462 (B.); *Drège* 409 (V.); *Drège* s.n. (O., Pa., Z., V., G.); *Hennegart* 45 (Pa.); ex Herb. Mrs. F. W. Barber (A.M.).

NATAL.—Port Natal, *Drège* (S.A.M.); edge of wood, Sydenham near Durban, *Wood* (G.); Pinetown district: Botha's Hill, *Wood* 6734 (P.); Pietermaritzburg district: near Howick, *Wood* 11432 (P.); Karkloof, *Dimock-Brown* 319 (P.); Krantzkop district: near Greytown, *Wylie* [Herb. No. 2046] (N., T.M.); *Wylie* [Herb. No. 22343] (N., T.M.); edges of bush, Tugela Valley, Krantzkop, *Thode* (B.); Klip River district: Van Reenen, *Wood* 1073 (N., T.M.); Districts unknown: Riet Spruit, *Wood* 10226 (N., T.M.); hills above Lynedock, *Wood* 4542 (K., B.); grassy slopes, Koenigsberg, *Thode* (B., S.); Zululand: Umgoya, *Wylie* [Wood 5665] (Pa.).

Var. **longidens** H. M. Forbes var. nov.

Lobis calycis multo longioribus et anguste lanceolatis valde distincta.

Type specimen, *Flanagan* 631, in National Herbarium, Pretoria.

CAPE.—Kongha district: grassy valleys near Komgha, *Flanagan* 631 (Z., N., A.M.); Albany district: in humidis umbris prope Grahamstown, *MacOwan* 2026 (B.M., A.M., K.); Grahamstown, *Rogers* 1578 (B.H.); Kentani district: in valleys, *Pegler* 404, 100 ft., 1904 (B.H.); 1200 ft., 1905, 1910, 1914 (N.); Umtata district: forests, Bazeia, *Baur* 38 (B.).

NATAL.—Ixopo district: Ixopo, *Schlechter* 6643 (A.M.).

This variety of *T. polystachya* is very similar in appearance to the variety *hirta*, but it is easily distinguished by the long narrow lanceolate calyx lobes. It is an erect shrubby plant, 2–4 feet high, with numerous pink or pale mauve flowers. The flowering period is from January to March.

Var. **hirta** Harv. in Harv. and Sond. Fl. Cap. 2.206 (1861–62).

Type specimen, *Sutherland* s.n., in Herbarium, Kew.

Stems, branches and inflorescence roughly rusty-pubescent, racemes shorter and more densely flowered than usual, and legumes more hairy.

CAPE.—Transkei, Indutywa district: near Colosa, *Krook* [*Penther* 2606] (V.); East Griqualand, Umzimkulu district: ad rivos Clydesdale prope flumen Umzimkulu, *Tyson* 1435 (Z., B., G., O., S.); in pratis apud rivulos circa Clydesdale, *Tyson* 2048 (K., G., S.A.M., B.H.); Pondoland, *Bachmann* 604, 617, 621 (B.).

NATAL.—Port Natal, *Gueinzius* 307 (Pa., V.); coast land, 0–1,000 ft., *Sutherland* (K.); Prospect, Durban North, *Forbes* 630 (N.); near Durban, *Wood* (G., A.M.); *Wood* 6269 (B.M., P.); edge of wood, Sydenham, near Durban, *Wood* (G.); Pinetown district: Hillary, *Wood* 13070 (N.); Pinetown, *Junod* 97 (Z.); Trappisten Kolonie, Mariannhill, *Landauer* 95 and 213 (B.); Umgeni district: Field's Hill, *Wood* 242 (B.M., N., B.H., S.A.M.); Krantzklouf, *Kuntze* (K.); Botha's Hill, *Wood* 6734 (Pa., B., P.); Greytown district: *Wylie* [H. No. 20461] (N.); *Wylie* [H. No. 22343] (N.); Krantzkop district: edge of bush, Krantzkop, Tugela Valley, *Thode* (B., S.); Estcourt district: Cathkin Park, Drakensberg, *Galpin* 11742 (K., P.); Tugela Valley, Mont-Aux-Sources, *Bayer* and *McClean* 226 (K.,

B.H., P., A.M.); Inanda district: Inanda, *Wood* 793 (K., B.M., N., B.H., Z., S.A.M.); *Kearsney, Milner* (N.); Tugela district: Nonoti, *Wood* 9188 (B.); Zululand, *Gerrard* 1106 (K., B.M., Pa., V.); Mtunzini, *Mogg* 4275 and 4374 (P.); Farm Egoa, *Curson* (P., S.); Farm 273, *Curson* 191 (P.); Bank of Pongola River, W. of Lebombo Mtns., Mkuzi, *Galpin* 13647 (Pa.); North Zululand, *Baker* [*Evans* 562] (N.).

ORANGE FREE STATE.—No definite locality, *Cooper* 1042 (K., B.M., V., Z., B.H.).

TRANSVAAL.—Pretoria district: Wonderboompoort, *Leendertz* 458 (T.M.); *Leendertz* 703 (B.H., T.M.); *Smith* 6062 (K., Pa., V., P.); Barberton district: Kaapmuiden, *Rogers* 23786 (W.); *Rogers* 25032 (Z., S.); Komatipoort, *Rogers* 21027 (K.); *Rogers* 12877 (W., A.M.); Lydenburg district: between Pilgrims Rest and Sabie, *Rogers* 24754 (Z.); Waterberg district: Messina, *Rogers* 19897 (K., W.); *Moss* and *Rogers* 99 (Z.); *Turner* 12 (P.); Potgietersrust, *Rogers* 1311 (Z.); Warmbaths, *Puttrill* 589 (P.); Pietersburg district: Makapansberge, Strydpoort, *Rehmann* 5536 (Z.); Houtbosch, *Rehmann* 6226 (Z.); Macoustie River, Farm Balloon, *Breyer* (T.M.).

PORTUGUESE EAST AFRICA.—Lourenço Marques, *Moss* 11856 (W.); Incanhine, *Schlechter* 12036 (K., Pa., G., Z., V., B., P., B.H., S.A.M., A.M.); Delagoa Bay, *Junod* No. M (Z., G.).

Var. *latifolia* Harv. in Harv. and Sond. Fl. Cap. 2.206 (1861–62); Burt Davy Fl. Tvaal. 1.2.378 (1932).

Type specimen, *Gucinzius* 616 in Herbarium, Kew.

Leaves 5–8 jugate; leaflets oblong, uncinal, retuse, 1.1–3.2 cm. long, 0.5–1.3 cm. broad; longer, broader, thinner and less hairy than *T. polystachya*.

CAPE.—Eastern Province: Engcobo Mtn., *Bolus* 8875 (B.H.); Insizwa, *Krook* [*Penther* 2641] (B., V.); near streams in thorns, Scottspoort, *Thode* (B., S.); Port St. Johns, *Moss* 2742 (W.).

NATAL.—At Port Natal, *Gucinzius* 616 (K., V.); Richmond district: Bush, Deepdale, *Evans* 102 (N.); Utrecht district: Klipspruit, *Breyer* (T.M.).

TRANSVAAL.—Barberton district: in damp valleys or margins of woods, Brown's Creek, *Galpin* 809 (K., P., B.H., S.A.M.); Barberton, *Thorncroft* 1907 (B.H.); *Thorncroft* [in Herb. F. A. *Rogers* 14217] (P.); Lydenburg district: Spitzkop Goldmines, Lydenburg, *Wilms* 351 (B.M., B.); Pietersburg district: Shiluvane, *Junod* 2376 (B.); Houtbosch, *Rehmann* 6237 (K., B.M., B.H.); in montibus saxosis, Houtbosch, *Bolus* 10997 (K., P., N., A.M., B.H.); *Schlechter* 4380 (B., B.H., T.M., A.M.); in bush on hills, New Agatha, *McCallum* 137 (Pa., G., P.); in collibus lapidosus graminosis prope Potgietersrust, *Bolus* 11072 (B.H.); Vallon du Masetane, *Junod* 1124 (K., B., Z., G., P.); Spelonken, *Junod* 54 (T.M.); Zoutpansberg district: edge of wood, The Downs, *Junod* 4352 (P., T.M.); Magoebas Kloof, *Pole-Evans* 3951 (K., P.); Minastone, Louis Trichardt, *Breyer* (T.M.); Hanglip, Louis Trichardt, *Bremekamp* and *Schweickerdt* 389 (P., T.M.).

SWAZILAND.—Mbabane, *Rogers* 11476 (B.H.); Hlatikulu, *Stewart* 93 (K., S.A.M., T.M.).

PORTUGUESE EAST AFRICA.—Lourenço Marques, *Quintas* 4 (B.).

An erect shrubby plant bearing a profusion of white, pink or pale mauve flowers. *Galpin* has a note on his specimen No. 809 that both pink and white flowers were borne on the same peduncle.

16. *T. noctiflora* Bojer in Hort. Maurit. 93 (name only) (1837); *Baker* in Oliv. Fl. Trop. Afr. 2.112 (1871); Dur. and Syll. Fl. Congol. 132 (1909); De Wild. Comp. Kasai 308 (1910); De Wild. Etudes Fl. Bas-et-Moyen-Congo 3.202 (1910); De Wild. Etudes Fl. Bas-et-Moyen-Congo 5.412 (1912); De Wild. in Bull. Jard. Bot. Bruxelles 4.98 (1914); De Wild. in Bull. Soc. Bot. Belg. 57.123 (1925); Burt Davy in Fl. Tvaal. 1.2.376 (1932).

Type specimen, *Bojer* (ad margines sylvarum et in agris ins. Zanzibarae, 1830), in Naturhistorisches Museum, Vienna.

Suffruticose. *Stems* diffusely branched, densely silky-pilose with short ascending brown hairs, particularly on the young parts. *Leaves* 5–8-jugate, 7–10 cm. long, subsessile; leaflets narrowly oblanceolate, apex rounded and mucronate, glabrous above, appressedly silky beneath, 1.5–3.5 cm. long, 3–5 mm. broad. *Stipules* linear-subulate, 8–9 mm. long. *Peduncles* terminal and occasionally leaf-opposed, 8.5–25.5 cm. long; racemes laxly flowered; pedicels 3–5 mm. long; bracts lanceolate, short. *Calyx* densely ferruginous-silky, tube 2 mm. long, four upper teeth deltoid, 1.5 mm. long, lowest lobe 2.5 mm. long. *Vexillum* 1–2.1 cm. long, 6 mm. broad, slightly falcate, densely silky-villous with brown hairs.

TRANSVAAL.—Barberton district: Komatipoort, *Schlechter* 11809 (K., B.M., Pa., G., Z., V., B.); Moss and *Rogers* 505 (W., B.H.); Barberton, *Thorncroft* [Herb. *Rogers* 22661] (Z., B.H.).

SOUTHERN RHODESIA.—On banks of Umzingwani River, Doddieburn Ranch, *Davison* 12 (P.) and *Davison* 51 (B.M., P.).

This species also occurs up the East Coast as far as Zanzibar.

17. **T. Dregeana** E. Mey. in *Linnaea* 7.169 (1832); Ecklon and Zeyher Enum. Pl. Afr. Aust. Extratrop. Pt. 2 (1834–35); Harvey in Harv. and Sond. Fl. Cap. 2.207 (1861–62). O. Kuntze Rev. Gen. Pl. 1.175 (1891); Ann. Bol. Herb. 1.1.15 (1914); Ann. S.A.; Mus. 9.4.256 (1915); Ann. Bol. Herb. 3.1.20 (1920); Bak. f. Leg. Trop. Afr. 1.189 (1926).

Syn. *Tephrosia brachyloba* E. Mey. Comm. Drège 110 (1835–36); *Tephrosia Damarensis* Engl. in Bot. Jahrb. 10.29 (1888); Die Veg. der Erde. 9.3.588 (1915); *Tephrosia Dinteri* Schinz in Vierteljahrsschr. Nat. Ges. Zurich 52.423 (1907).

Type specimen, *Drège* s.n., in Botanisches Museum, Berlin-Dahlem.

Suffruticose, branching from the base. *Stems* woody at base, rigid, striate; thinly appressedly hairy. *Leaves* 1.3–8 cm. long, 2–4-jugate, petiolate; leaflets linear-lanceolate, pale green above, thinly appressedly pubescent beneath, 0.8–8.5 cm. long, 1–8 mm. broad. *Stipules* 2–8 mm. long, narrow subulate, acuminate. *Peduncles* 3.5–38 cm. long, leaf-opposed and terminal, laxly flowered. *Flowers* small, 5–6 mm. long; pedicels 3–7 mm. long. *Calyx* thinly appressedly hairy, two upper lobes very small, three other lobes about equal (1.5–2 mm. long) and about equal to the length of the calyx-tube. *Vexillum* orbicular, 5 mm. long and broad, thinly hairy without; carina and alae 4.5–5 mm. long, 1.5–2 mm. broad. *Ovary* 3 mm. long, pubescent. *Style* 2 mm. long, glabrous. *Pod* curved, 3–4 seeded, 1.5–3 cm. long, 3–4 mm. broad, sub-glabrous, pale yellowish-green.

SOUTH WEST AFRICA.—Otavi, *Dinter* 5486 (D. Coll.); Inachab, *Dinter* 1154 (Z., B.) [type of *T. Dinteri* Schinz]; Koes-Riedmond, *Pfiel* 138 (B.); between Ausis and Khuias, *Schenck* 62 (Z.); Lichtenstein, *Dinter* 4247 (D. Coll.); Utschoa, *Prager* 61 (B.); granite slopes at Welwitsch; March, *Pearson* 4417 (K.); Welwitsch, *Galpin* and *Pearson* 7620 (K., S.A.M., P.); and *Galpin* and *Pearson* 7628 (K.); on rocky mtns. at Natamas, *Lindner* (Z.); Damarabezirk Namib Kan-Tal Sandige Keissteppe, *Engler* 6056 (B.); Haikamchab, *Galpin* and *Pearson* 7613 (K., S.A.M., P.); near Hykamhab, *Marloth* 1210 (K., S.A.M., P., B.H.); Wustennuusale ca. 50 Km. ostl. Swakopmund, *Dinter* 6699 (D. Coll.); Rossing, *Boss* A104 (T.M.); Langer Heiririch Granitberge, *Boss* A89 (T.M.); Okahandja-Otjisani, *Dinter* 4567 (D. Coll.); *Dinter* s.n. (B.); Quickborn, Okahandja, *Bradfield* 398 (P.); Okahandja, *Dinter* 568 (B.); Windhoek, *Gillman* 123 (S.A.M.); *Pearson* 9775 (K., B.H.); *Fermer* 28 (B.); Rehoboth, *Fleck* 683 (Z.); Naukluft Mtns., river bed between Nautzurus Noab and Gous Koichas, *Pearson* 9078 (K.); between Gelwater and Gt. Fish River, *Pearson* 9222 (K., S.A.M., B.H.); Gt. Karas Mtn., E. of Holoog, *Pearson* 9757 (K., B.H.); Gt.

Karasberg Ravine on Kleiap River 5 miles S.E. of Wasserfall, *Pearson* 7891 (K., B.M., A.M., N., B.H., S.A.M.); nach Garub Zu Kriszes, 1400 m., *Dinter* 3705 (D. Coll.); Garub, *Range* 261 (B.); Kuibus-Klippdachs River, *Engler* 6735 (B.); Keetmanshoop, *Fenchel* 1921 (Z.); *Fleck* 682 (Z.); Kalkfontein, *Schafer* 45 (B.); In arenosis prope Aiais, *Marloth* 4773 (B., P., S.); Aiais, *Prager* 621 (B.); sand south of Warmbad, *Pearson* 5031 (K., B.H.); Klein Karas, *Ortendahl* 224 (P.); *Schafer* 57 (B.); common in valleys N. of Sabiesis, *Pearson* 4113 (K.); near Grundoon, *Pearson* 4576 (K., B.H.); dry shale banks, Gt. Fish River, *Pearson* 9263 (K., B.H.).

CAPE.—Little Namaqualand.—dry sandy bed of Oorlap River, Richtersveld, *Herre* (S.); 11867 (S.); sides of dry bed of Koodas River, *Pillans* 5530 (B.H.); dry water courses between hills S.E. Sendling's Drift, *Pillans* 5098 (B.H.); dry sandy bed of river at Anisfontein, *Pillans* 5500 (B.H.); sandy soil S. of Viool's Drift, *Taylor* 1178 (B.H.); sandy flats near Viool's Drift, Orange River, *Thorne* (S.A.M.); shale hills N. of Rooival near Orange River, *Pillans* 6410 (B.H.); near Ramans Drift, *Pearson* 4521 (K.); near Gariep ditiones, Beaufort, *Drège* (K., B.M., Pa., G., B.); Great Bushmenland; common in dry river beds near Pella, *Pearson* 3556 (K.); Herbert district: Honeyneest Kloof Kop near Station, *Victor* [Herb. No. 1474] (Kim., K., T.M.); on koppie among stones, Honeyneest Kloof Station, *Victor* 983 (Kim.); the berg above the Kloof, Campbell, *Wilman* 1473 (Kim.); The Koppen, Rooipoort, *Wilman* 2267 (A.M., Kim.); Barkly West district: on the hills, Newlands, *Wilman* 3222 (Kim., B.H.); Hay district: Klipfontein, *Wilman* (B.H.); Bushmans district: Bushmans Fountain, *Wilman* (B.H.); Prieska district: Prieska, *Bryant* 361 (P.); Gathand around Prieska, *Bryant* 1086 (K.); Prince Albert district: Prince Albert Road, *Thoday* and *Delf* 102 (S.). No definite locality: *Drège* 413 (V.); *Hennegart* 92 (Pa.).

18. *T. pallens* (Ait.) Pers. Syn. 2.329 (1807); DC. Prodr. 2.254 (1825); Spreng. Syst. Veg. 3.235 (1826); Ecklon and Zeyher Enum. Pl. Afr. Aust. Extratrop. 247 (1835); Steudel Nomen. Bot. 666 (1840); Harvey in Harv. and Sond. Fl. Cap. 2.205 (1861-62); O. Kuntze Rev. Gen. Pl. 1.185 (1891); Wood Fl. of Natal 42 (1907); Wood in Trans. S.A. Phil. Soc. 18.2.147 (1908); Bews Fl. Natal and Zululand 111 (1921).

Syn. *Galega pallens* Ait. Hort. Kew. 3.71 (1789); Linn. Syst. Nat. ed. 13 per Gmelin 2.11.1129 (1792); Willd. Sp. Pl. 3.11.1245 (1803); Linn. Syst. Nat. 6.1215 (1806); *Galega humilis* Thunb. Prodr. 134 (1800); *Tephrosia unguolata* E. Mey. Comm. 109 (1836).

Type specimen, *Thunberg* s.n., in Thunberg's Herbarium, Uppsala, Sweden.

Suffruticose. Stems erect or ascending, angularly bent, rib-striate, pubescent. Leaves shortly petiolate, 4-8-jugate, 2-6 cm. long; leaflets narrow, cuneate-oblong, mucro recurved, striolate and thinly pubescent, dark green above, silky and pale green below, 0.8-2.5 cm. long, 0.2-0.7 cm. broad. Stipules subulate, 3-6 mm. long. Peduncles terminal and leaf-opposed, angular, furrowed, 6-19 cm. long. Flowers about 1 cm. long. Calyx subequally 5-toothed. Vexillum subrotund, sericeous or pubescent without. Style glabrous. Legume 3.5 cm. long, 0.3 cm. broad, linear, flat, velvety pubescent.

CAPE.—Graaff Reinet district: on Sneeuwberg, *Wallich* (B.M., G.); Somerset East district: Somerset, *Bowker* (K.); Uitenhage district: near Olifantshoek, *Ecklon* and *Zeyher* 5728 (B.); *Zeyher* s.n. (S.A.M.); near Olifantshoek and Bushman's River, *Ecklon* and *Zeyher* (K., B.M., O., Pa., Z., V., G., B., P., S.A.M.); Albany district: on plains of Albany, *Bowie* 10 (B.M.); Albany, *Alexander* 104 (K.); Howisonspoort pone Grahamstown, *Zeyher* 2708 (Pa., S.A.M.); Grahamstown, *Robertson* (P.); Longmore Forest Reserve, *Long* 1036 (K.); in lapidosus ad ped. Bothasberg, *MacOwan* 478 (K., B., Pa., N., A.M.); Alexandria, *Galpin* 10813 (K., P., B.H.); *Galpin* 10638 (K., P., B.H.); *Burt Davy* 12104 (P.); Kleinmond, *White* 967 (Z., A.M.); Bathurst district: Bathurst, *Rogers* (A.M.); Port Alfred, Kowie, *Tyson* (P., T.M., S.). No definite locality, *Drège* 2708 and 407 (V.); *Thunberg* (U.); *Banks* (V.); *Drège* in Herb. Meyer 6697 (B.).

19. *T. delagoensis* H.M. Forbes sp. nov., affinis *T. Dregeanae* E. Mey., sed foliis brevioribus, fructubus differt

Suffrutex erectus. *Caules* ramosi. *Folia* 3-8-jugata, 2-5.5 cm. longa; foliola oblanceolata, 0.8-1.8 cm. longa, 2-5 mm. lata, retusa, mucronata, supra glabra, subtus appresse pubescentia; stipulae subulatae, 3-4 mm. longae, nervatae. *Flores* circiter 1 cm. longi; pedicelli 3-4 mm. longi; dentes calycis tubo longiores. *Fructus* angustus, planus, 3-4.5 cm. longus, 3 mm. latus, apice leviter falcatus, parce pubescens.

Type specimen, *Schlechter* 11521 in National Herbarium, Pretoria.

Suffruticose. *Stems* erect, branching, woody. *Leaves* 3-8-jugate, 2-5.5 mm. long, shortly petioled; leaflets oblanceolate, mucronate, retuse, glabrous above, appressedly pubescent below, 0.8-1.8 cm. long, 2-5 mm. broad. *Stipules* subulate, 3-4 mm. long, nerved. *Peduncles* terminal and leaf-opposed, laxly flowered; bracts short, linear; pedicels 3-4 mm. long. *Calyx*-tube about 3 mm. long, lobes 3-4.5 mm. long. *Vexillum* 1 cm. long, 6 mm. broad, pubescent without. *Ovary* pubescent, 4 mm. long. *Style* 2-5 mm. long, flattened, glabrous. *Legume* narrow, apex slightly falcate, 3-4.5 cm. long, 3 mm. broad, thinly pubescent.

PORTUGUESE EAST AFRICA.—In arenosis Lourenço Marques, *Schlechter* 11521 (K., P., A.M., B.H.).

20. *T. amoena* E. Mey. Comm. Pl. Afr. Aust. 109 (1836); Harvey in Harv. and Sond. Fl. Cap. 2.206 (1861-62); O. Kuntze Rev. Gen. Pl. 1.174 (1891); Wood Fl. Natal 41 (1907); Wood in Trans. S.A. Phil. Soc. 18.2.147 (1908); Bews Fl. Natal and Zululand 110 (1921).

Type specimen, *Drège*, in Botanisches Museum, Berlin-Dahlem.

Fruticulose. *Stems* erect, branching, branches very slender, subfastigiata. *Leaves* shortly petiolate, 7-9-jugate, subrecurved-patulate, 2.5-6 cm. long; leaflets 2-5 mm. broad, up to 1.5 cm. long, cuneate-linear, obtuse, subtruncate or mucro-recurved, glabrous above, appressedly hirsute below. *Stipules* subulate, 3-6 mm. long. *Peduncles* axillary and terminal, slender, 4-13 cm. long, laxly racemose. *Flowers* about 7.5 mm. long, usually in pairs. *Pedicels* longer than the bracts, 3-7 mm. long. *Bracts* subulate, 2-3 mm. long. *Calyx*-tube 2 mm. long, 5-5 mm. in diam., lobes unequal, 1-2 mm. long, upper two slightly connate. *Vexillum* silky without, about 7 mm. long and broad. *Ovary* silky, 4 mm. long. *Style* glabrous, 3 mm. long. *Legumes* narrow, pubescent or glabrescent.

CAPE.—Queenstown district: Queenstown, *Page* (B.H.); Pondoland district: grassy fields above Ngogwane Falls, Lusikisiki, *Galpin* 9531 (K., P.); Omsamcaba, *Drège* (B.); Pondoland, *Drège* (K., V.).

NATAL.—Umkomaas district: Umkomaas, *Wylie* (N.); Zululand, Ntondweni, *Wood* 10938 (A.M.); no definite locality, *Wylie* (Pa.).

SOUTH AFRICA.—No definite locality, *Drège* 408 (D., V.); *Drège* 5466 (B.).

21. *T. Medleyi* H.M. Forbes sp. nov., affinis *T. amoenae* E. Mey., sed foliis latioribus longioribusque, floribus majoribus differt.

Suffrutex caulibus erectis glabris vel parce pubescentibus. *Folia* 4-8-jugata, 3-7 cm. longa; foliola cuneato-oblonga, 1-2.5 cm. longa, mucronata, utrinque glabra vel subtus parce pubescentia; pedunculi terminales axillaresque, usque 9 cm. longi; bractae ovato-acuminatae, caducae, 5 mm. longae. *Flores* 1.5 cm. longi; dentes calycis tubo excedentes; stylus pilosus.

Type specimen, *Wood* 5984, in Natal Herbarium, Durban.

Suffruticose. *Stems* erect, branching, glabrous or very sparsely pubescent. *Leaves* 4-8-jugate, shortly petioled, 3-7 cm. long; leaflets cuneate-oblong, retuse, mucronate, glabrous on both sides or very sparsely pubescent below, 1-2.5 cm. long, 0.5-0.8 cm. broad; petiolules about 1.5 mm. long, more or less densely pubescent. *Stipules* subulate-acuminate, 0.5-1 cm. long. *Peduncles* terminal and axillary, up to 9 cm. long, few-flowered at apex. *Bracts* ovate-acuminate, 5 mm. long, soon caducous. *Calyx* teeth linear-lanceolate, longer than the tube, lowest longest. *Style* bearded. *Legumes* not seen.

NATAL.—Krantzkop district: near Greytown, Wood 5984 (N.).

This is, apparently, a slender shrubby plant. The stems, petioles, stipules and bracts are a dark reddish colour and the veining on the lower surface of the leaflets is also a dark brown. The flowers are pink.

This plant has been named in honour of the late Dr. Medley Wood, one of the great pioneer botanists of Natal.

22. **T. discolor** E. Mey. Comm. Pl. Afr. Aust. 1.1.110 (1836); Harvey in Harv. and Sond. Fl. Cap. 2.207 (1861-62); O. Kuntze Rev. Gen. Pl. 1.175 (1891); Wood Fl. of Natal 42 (1907); Wood in Trans. S.A. Phil. Soc. 18.2.147 (1908); Bews Fl. Natal and Zululand 111 (1921); Bak. f. leg. Trop. Afr. 1.189 (1926).

Type specimen, Drège s.n., in Botanisches Museum, Berlin-Dahlem.

Suffruticose. *Stems* erect, slender, virgate, angular, rib-striate, canescent. *Leaves* 1-6-jugate, shortly petiolate, 1-3 cm. long; leaflets linear, subobtusely, margins thickened, mucro recurved, glabrous and green above, more or less densely canescent beneath, 1.2-3.5 cm. long, 1-3.5 mm. broad. *Stipules* subulate, 3-6 mm. long, pedicels 3 mm. long. *Calyx* silky, tube 5 mm. in diam., 2.5-3 mm. long; lobes narrow, acuminate, unequal, 2.5-4.5 mm. long. *Vexillum* 1 cm. long, 6 mm. broad. *Ovary* 5.5 mm. long, densely silky. *Style* 3.5 mm. long, glabrous. *Legumes* 5.5 cm. long, 3-4 mm. broad, narrow-linear, fulvous-pubescent, many-seeded; seeds small, dark brown.

NATAL.—Grassy places near Port Natal, Drège (K., Pa., O., G., B., P.); Gueinzins (K., B.M., P.); Natal, Gerrard 756 (K., P.); Durban Flat, Wood (N.); Wood 3127 (K.); near Durban, Wood 5586 (G.); Wood 6373 (P.); Wood (N.); Wood 9565 (B., S.A.M.); no definite locality, Drège 414 (V.); Gerrard and McKen 419 (N.).

PORTUGUESE EAST AFRICA.—Delagoa Bay, Junod 179 (G., Z.).

23. **T. euchroa** Verdoorn in Bothalia 3.239 (1937).

Type specimen, Obermeyer, Schweickerdt and Verdoorn 73, in National Herbarium, Pretoria.

Small suffrutex more or less 30 cm. high, many-branched, erect or branches decumbent. Branches cano-pubescent, glabrescent. *Leaves* imparipinnate, 2-6-jugate; leaflets oblanceolate-oblong or oblong, 0.9-3 cm. long, 3-9 mm. broad, cano-pubescent on both sides, upper at length glabrescent, apex minutely mucronate or retuse, petiolate, petiolules 3 mm. long, densely cano-pubescent. *Stipules* lanceolate, acute, 3-5 mm. long, cano-pubescent, 3-nerved. *Racemes* 3.5-11.5 cm. long, terminal, longer than the leaves, laxly flowered, lower flowers sometimes in axils of upper leaves. *Flowers* 1.5-2 cm. long, reddish, 1-3 together, pedicels 3-5 mm. long; bracts lanceolate, acute, cano-pubescent, 3-4 mm. long, 1.5 mm. broad. *Calyx* cano-pubescent, tube 6 mm. in diam., 2 mm. long, lobes triangular, narrow, acute, unequal, 1.5-3.5 mm. long. *Vexillum* appressedly pubescent without, suborbicular, 1.5-2 cm. long and broad, with two small swollen appendages at apex of claw. *Ovary* 5 mm. long, densely pubescent. *Style* glabrous. *Legumes* linear, appressedly cano-pubescent, 3-3.5 cm. long, 3 mm. broad.

TRANSVAAL.—Zoutpansberg district: rocky slope, N.W. slopes, Zoutpansberg, Obermeyer, Schweickerdt and Verdoorn 73 (P., T.M.); among rocks, lower slopes of Zoutpansberg, Schweickerdt and Verdoorn 529 (B.M., P.); Messina, Young [14565 in Herb. Moss] (W.); Young [14566 in Herb. Moss] (B.M., W.); Rogers 23664 (P., W.); Waterval Boven, Mason (K.); no definite locality, Rogers 15651 (B.H.).

This is very distinct from all the known Transvaal species of *Tephrosia*. The silvery-grey colour of the bush and the pinkish-red flowers suggested the specific name. It is somewhat like *T. noctiflora* but has much larger flowers. The flowers of each raceme develop at different intervals and one finds several large open flowers while the buds above are still very immature. [Verdoorn in Bothalia 3.2.239 (1937).]

24. *T. pallida* H. M. Forbes sp. nov., affinis *T. euchroae* Verdoorn, sed foliolis minoribus glabris supra pallido-viridibus, pedunculis longioribus differt.

Suffrutex caulibus erectis canescentibus. *Folia* 5-9-jugata, 7-13.5 cm. longa; foliola oblanceolata, mucronulata, 0.8-1.8 cm. longa, 0.4-0.5 cm. lata, subtus canescentia supra pallida glabraque, marginibus involutis; stipulae lineari-sublatae, 3-4 mm. longae; pedunculus 18-35 cm. longus, laxiflorae; bractae lineares; stylus glaber. *Fructus* 4.5 cm. longus, 0.4-0.5 cm. latus, apice leviter falcatus, parcissime pubescens.

SOUTH WEST AFRICA.—Stingbank, legit E. G. R. Erdaile, Com. Rogers 15386 in Herb. arium Kew, Type.

Suffrutex. *Stems* erect, branching, striate, densely canescent. *Leaves* 5-9-jugate, long petioled, 7-13.5 cm. long, petiole 1.5-2.5 cm. long before first pair of leaves, internodes between leaflets 1.1-1.5 cm., leaflets oblanceolate, shortly mucronate, mucro recurved, margins involute, densely canescent below, pale and glabrous above, 0.8-1.8 cm. long, 4-5 mm. broad; petiolules 1-2 mm. long. *Stipules* linear-lanceolate, 3-4 mm. long. *Peduncles* terminal, 18-35 cm. long, laxly flowered, flowers 2-3-nate. *Calyx* canescent, lobes longer than tube. *Style* glabrous; ovary densely canescent. *Legume* 4.5 cm. long, 4-5 mm. broad, linear, slightly falcate towards apex, thinly pubescent, 7-8-seeded.

Only one specimen of this plant was seen. It appears to be a fairly tall shrubby plant, densely canescent in all parts.

25. *T. Kraussiana* Meisn. in Hook. Lond. Journ. Bot. 2.87 (1834); Cape Plants, Krauss and Engler 54 (1846); Harvey in Harv. and Sond. Fl. Cap. 2.206 (1861-62); O. Kuntze Rev. Gen. Pl. 1.175 (1891); Wood and Evans Natal Plants 3. pl. 249 (1901); Wood Fl. of Natal 42 (1907); Wood in Trans. S.A. Phil. Soc. 2.147 (1908); Bews Fl. Natal and Zululand 111 (1921); Watt and Breyer-Brandwyk Med. and Pois. Pl. S.A. 74 (1932).

Type specimen, *Krauss* 40, in Herbarium, Kew.

Fruticose, branches straight, erect, sulcate or angular, especially at the extremity, densely leafy. *Leaves* shortly petiolate, 2.5-3.8 cm. long, 6-12-jugate; leaflets 0.8-3.6 cm. long, 2-6 mm. broad, linear, usually complicate, very shortly mucronate, mucro recurved, glabrous or very thinly pubescent above, more densely pubescent below. *Stipules* linear-setaceous, longer than the petiole, pubescent, 0.5-1.3 cm. long. *Peduncles* terminal and in axils of upper leaves, simple or branching, laxly racemose, 5-14 cm. long. *Flowers* 0.7-1 cm. long, 2-3 together in axils of setaceous bracts, pedicellate. *Calyx*-tube 6-7 mm. in diam., 2-3 mm. long, lobes lanceolate, acuminate, unequal, 1-4 mm. long, whole calyx pubescent. *Verillum* pubescent without, 0.75-1 cm. long, 6-8.5 mm. broad. *Ovary* 4.5-6 mm. long, densely silky. *Style* glabrous. *Legumes* narrow, linear, thinly canescent, 3-3.5 cm. long, 4 mm. broad.

CAPE PROVINCE.—East London district: sandy grassy places, East London, *Thode* (S.); *Ratray* 297 (A.M.); hillside near Kentani River Mouth, *Galpin* 6549 (A.M., P.); Komgha district: grassy hills near Kei Mouth, *Flanagan* 48 (P., B.H., A.M., S.A.M.); Pondoland: no definite locality, *Bachmann* 614 (K., B.M., Z., B.).

NATAL.—Port Shepstone district: Margate, *Rump* (N.); sandy grassy places, Beach Terminus, *Thode* (B., S.); Ixopo district: farm Friedenau, Dumisa, *Rudatis* 821 (K., B.M., V., G., Z., B., P.); *Rudatis* 257 (K., B.M., Pa., B., P.); Durban district: Port Natal, *Krauss* 49 (K., B.M., G., P.); *Gueinzus* 17 (Pa., Z., S.A.M.); Coastland, *Sutherland* (K.); Clairmont, *Wood* (G.); Durban, *Wood* 9983 (N.); *Wood* (A.M.); *Wood* 6260 (B., Z., P.); Sydenham near Durban, *Wood* 225 (K., B.M., B., N., S.A.M., A.M., B.H.); Palmiet near Durban, *Wood* 8427 (Pa., N.); *Wood* 10924 (Z., N., W.); Pinetown district: New Germany, *Wood* 12695 (N., T.M.); Bothas Hill, *Wood* 10262 (P., T.M.); Inanda district: Inanda, *Wood* 807 (K., S.A.M.); and 807 A (K., B.M.); near Umzinyati Falls, *Haygarth* [Herb. *Wood* 4717] (G., Z.); Chakas Kraal, *Thode* (S.); Nonoti, *Wood* 8733 (B., Z.); *Wood* 9207 (N.); Zululand, Entonjaneni, *Gerstner* 3687 (N.). No definite locality, *Gerrard* 642 (B.M.); *Gerrard* 1079 (K., B.M.); *Gerrard* 724 (K.); *Gerrard* and *McKen* 352 (K., B.M., Pa., V.).

SWAZILAND.—Kubuta Estate, Hlatikulu, *Pierce* 14 (P.).

The Zulus know this plant as "inSangwana" or "isiPhungo" and they make a warm infusion of the root as a remedy for a troublesome night cough.

26. ***T. sparsiflora*** H. M. Forbes sp. nov., affinis *T. purpureae* (L.) Pers., sed foliis minoribus, caulibus gracilioribus, floribus paucis minoribus differt.

Caules erecti vel ascendentes, pubescentes. *Folia* 3-5-jugata, 2.5-4.5 cm. longa; foliola oblonga-cuneata, mucronata, 0.8-2.5 cm. longa, 0.5-1.3 cm. lata, utrinque appresse pubescentia; stipulae setaceae, 4 mm. longae; pedunculi 8-16 cm. longi; bractae setaceae, 2 mm. longae. *Flores* pauci, 5 mm. longi; dentes calycis tubo aequilongi; stylus glaber. *Fructus* linearis, 3-3.5 cm. longus, 0.4 cm. latus, parce breviterque appresse pubescens, apice leviter falcatus.

Type specimen, *Repton* 1614, in National Herbarium, Pretoria.

Stems erect or ascending, pubescent. *Leaves* 3-5-jugate, 2.5-4.5 cm. long, very shortly petioled; leaflets oblong-cuneate, mucronate; appressedly pubescent on both sides, 0.8-2.5 cm. long, 0.5-1.3 cm. broad. *Stipules* setaceous, 4 mm. long. *Peduncles* 8-16 cm. long, terminal and leaf-opposed, very laxly flowered, flowers 1-2 together. *Bracts* setaceous, 2 mm. long. *Flowers* 5 mm. long, "pinkish". *Calyx* teeth subequal to tube. *Style* glabrous. *Legumes* linear, 3-3.5 cm. long, 0.4 cm. broad, slightly and shortly appressedly pubescent, apex slightly falcate.

TRANSVAAL.—Pretoria district: Wonderboom Reserve, S. side of Magaliesberg, *Repton* 1614 (P., N.); Marico district: Zeerust, *Thode* A. 1392 (P., N.).

BECHUANALAND.—Vryburg, *Mogg* 4902 (P.).

27. ***T. polystachyoides*** Bak. f. *Leg. Trop. Afr.* 1.193 (1926): *Burtt Davy Fl. Tvaal.* 1.2.378 (1932).

Type specimen, *Teague* 14, in Herbarium, Kew.

Suffrutescent. *Stems* erect, branching, often rufo-tomentose above. *Leaves* 5-17-jugate; leaflets 1.5-3 cm. long, 0.5-1.2 cm. broad, oblong or elliptic, apex shortly mucronulate, mucro recurved, glabrous or thinly appressedly pubescent above, more or less densely pubescent below, pubescence white or tawny. *Stipules* 4-6 mm. long, linear. *Peduncles* 6-30 cm. long, laxly racemose. *Flowers* 0.8-1.5 cm. long, 3-4 together, lowest flowers sometimes in axils of upper leaves; pedicels 3-5 mm. long; bracts linear. *Calyx* densely long pilose, lobes linear-lanceolate, much longer than the tube. *Style* glabrous. *Legumes* 3-3.8 cm. long, 3-4 mm. broad, falcate, densely tawny pubescent.

TRANSVAAL.—Pretoria district: Derdepoort, *Rehmann* 4778 (K., B.M.); Rietfontein, *Venter* (Pa., P.); Pretoria, *Fouche* (P.); Silkeats Nek, *van Dam* (T.M.); Saltpan, *Leeman* (T.M.); Wonderboompoort, *Schlechter*, 4164 (K., B.M., Pa., G., B.H., V., A.M.); *Leendertz* 703 (B.H., T.M.); *Thode* A 408 (K., P., N.); *Smith* 1656 (P.); 1932, *Smith* 6202 (K., P., N.); 1932, *Smith* 6203 (P., V.); Barberton district: Pyramid Estate near Potgietersrust, *Galpin* 8958 (P.); Griffin Mine, *Breyer* (T.M.); Kaapsche Hoop, *Rogers* 20834 (K., Pa., P., T.M.); Nelspruit, *Breyer* (T.M.); *Liebenberg* 2466 (P.); Rustenburg district: stony koppie S.W. of town, Rustenburg, *Nation* 156 (K., B.H.); *Nation* 164 (B.H.); *Fouche* 23 (P.); Pietersburg district: Houtbosch, *Rehmann* 6238 (K., B.M., Z.); *Schlechter* 4400 (B., B.H., A.M., T.M.); Pietersburg, *Rogers* 14644 (K.); in graminosis prope pagum Pietersburg, *Bolus* 10912 (K., P., B.H., A.M.); Gravelotte, *van Dam* in Tvl. Mus. 25040 and 25041 (T.M.); Rooikop, *Pole Evans* 1261 (K., P.).

RHODESIA.—Umtali Div.,—Marico district: Odanzi River Valley, *Teague* 14 (K., B.H., P.); Salisbury, *Eyles* 2050 (Pa., P., S.A.M.); Ses-Heke, Barotseland, *Borle* (P.); Mazabuka, *Rogers* 26147 (T.M.).

28. *T. Ehrenbergiana* Schweinf. Beitr. Fl. Aethiop. 18 (1827); Bak. f. Leg. Trop. Afr. 1.209 (1926); Klotzsch in Peters Reise Mossamb. Bot. 576 Corrigenda (1863).

Syn. *Tephrosia villosa* sec. Bak. f. Leg. Trop. Afr. 1.208 (1926) non (L.) Pers.; Baker in Oliver Fl. Trop. Afr. 2.122 (1871) pro parte; Die Veg. der Erde 9.3.589 (1915); *Cracca villosa* sec. Hiern in Cat. Afr. Pl. Welw. 1.223 (1896), non Linn.; *Cracca villosa* L. var. *incana* sec. Hiern in Cat. Afr. Pl. Welw. 1.223 (1896), non O. Ktze; *Tephrosia Apollinea* sec. Klotzsch in Peters Reise Mossamb. Bot. 47 (1861) non (Del.) DC.; sec. Eyles in Trans. Roy. Soc. S. Afr. 5.4.375 (1916) non (Del.) DC. pro parte. *Tephrosia rhodesica* Bak. f. Leg. Trop. Afr. 1.208 (1926); Burt Davy Fl. Tvaal. 1.2.378 (1932); *Tephrosia incana* sec. Bak. in Oliv. Fl. Trop. Afr. 2.123 (1871) excl. syn. pro parte, non Graham; Die Veg. der Erde 9.3.589 (1915).

Stems erect, branching, yellow-villous. Leaves 9–10 cm. long, 5–9-jugate; leaflets 2–3·7 cm. long, 0·6–1·2 cm. broad, narrow oblong, apex obtuse or emarginate, mucronate, upper surface thinly, lower surface densely pubescent. *Stipules* linear, 0·5–1 cm. long. *Peduncles* terminal and lateral, 11–18 cm. long, laxly-flowered, lower flowers 3–4 together. *Flowers* shortly pedicellate, about 1–1·2 cm. long. *Calyx* densely silky, tube 7–8 mm. broad, 2·5–3 mm. long, lobes more or less sub-equal, linear-subulate, 4–6 mm. long. *Vexillum* ovate or suborbicular, 1–1·2 cm. broad, 1–1·1 cm. long, densely silky on the back. *Ovary* densely silky, 6–6·5 mm. long. *Style* glabrous 4–5 mm. long. *Pod* pubescent, falcate, 4 cm. long, 0·5 cm. broad.

SOUTH WEST AFRICA.—Grootfontein, *Schoenfelder* 948 (D. Coll.); Gaub Gneissburg, *Dinter* (B.); Okahandja, *Dinter* 4608 (D. Coll.); auf sandalluv in Okahandja River, *Dinter* II 13. (B.); Karibib Landsternhuzel, *Dinter* 6915 (D. Coll.); Karibib am Damm von Roseman's farm Okongawa, *Dinter* 6808 (D. Coll.); Amerb. Gramtbanke, *Dinter* 6852 (D. Coll.); Uaobos in zu Kuimfulsu, *Dinter* 1413 (B.); Omburo Platze am Rivier, *Dinter* 1409 (B.); Kaross, *Thorne* (S.A.M.).

TRANSVAAL.—S.A. Gold Fields, *Baines* (K.); Waterberg district: Messina, *Rogers* 19242 (K., P.); *Rogers* 20813 (T.M.); *Rogers* 20984 (Wits., Z.); Rooikop, *Pole-Evans* 1261 (Pa.); Palala River, *Breyer* (T.M.).

RHODESIA.—Mazabuka, *Rogers* 26147 (T.M.); Deka River, Wankie, *Eyles* 7962 (K.); Victoria Falls, *Rogers* 5558 (K., B.H.); Bulawayo, *Eyles* 1062 (K., A.M.) [*Type of T. rhodesica* Bak. f.]; *Borle* 162 (K., Z., P.); Odanzi River Valley, Umtali, *Teague* 435 (K., B.H., S.); Que Que, *McLeod* 52 (K., Pa.).

This species also occurs in Angola, Portuguese East Africa and Tanganyika.

Tephrosia villosa (L.) Pers. and *T. incana* Graham are Indian species which, in their typical form, do not occur in Africa. African material placed under the above species by various authors, i.e., are referable to the Tropical African *T. Ehrenbergiana* Schweinf. *T. rhodesica* Bak. f. exhibits no striking differences from *T. Ehrenbergiana* Schweinf. except in the colour of the indumentum. This, however, appears to be variable, for Schweinfurth, l.c. 19, states the pubescence of the specimens he examined to be silvery white and in parts, as a result of drying, somewhat brownish.

T. villosa (L.) Pers. is based on *Galega villosa* L., which in turn is based on a figure in Burm. Thes. Zeyl. 73 t. 33 (1737). Unfortunately, there is no specimen of *Galega villosa* L. in the Linnean Herbarium. Burmann's figure represents a species which is more slender and smaller in most parts than the African material usually incorrectly identified with this species. Modern gatherings of the true Indian plant in the Herbarium, Kew, confirm this statement.

T. incana Graham has already been stated by Baker, l.c., not to occur in Africa.

T. Apollinea (Del.) DC. is an Egyptian plant which apparently does not occur in Southern Africa. It is likewise a more slender species with smaller and far less densely pubescent vegetative and reproductive parts than typical *T. Ehrenbergiana*. The plants referred to *T. Apollinea* by Klotzsch l.c. and Eyles l.c., should be placed under *T. Ehrenbergiana*.

29. ***T. oxygona*** Welw. in Oliv. Fl. Trop. Afr. 2.114 (1871); Engl. Bot. Jahrb. 9.29 (1888); Die Veg. der Erde 9.3.588 (1915); Bak. f. Leg. Trop. Afr. 1 (1926).

Type specimen, *Welwitsch* 2104, in Herbarium, Kew.

An erect shrub, 3-4 ft. high, branching freely; stems argenteo-canescens. *Leaves* 8.5-15.5 cm. long, 5-10 jugate (13-19 jugate in Fl. Trop. Afr.); leaflets 1-3.5 cm. long, 0.5-2 cm. broad, obovate-oblong, coriaceous, mucronate, canescent on both surfaces, densely when young, more thinly and sparsely when older, veining on lower surface tawny, distinct and slightly raised. *Stipules* linear, rigid, 2-7 mm. long. *Peduncles* axillary and terminal, laxly flowered, 12-27.5 cm. long. *Flowers* approximately 1.5 cm. long. *Pedicels* 2-5 mm. long, longer than the linear bracts. *Calyx*-tube 3 mm. long, 7 mm. in diam., lobes unequal, two upper deltoid-cuspidate, about 1.5 mm. long, lower lanceolate, about equalling the tube in length. *Vexillum* silky without, 1.5 cm. long and broad. *Ovary* silky, 7 mm. long. *Style* glabrous, 4 mm. long, flattened, penicillate at apex. *Pods* curved, 4.5-6 cm. long, glabrescent.

ANGOLA.—*Welwitsch* 2104 (K., Pa., B.); river bed in open at Kin on the Mossamedes Railway, *Pearson* 2393 (K., B.H., B.); Mossamedes, *Welwitsch* 21110 (K.).

SOUTH WEST AFRICA.—Damaraland: in arenosis Otyimbinque, *Marloth* 1382 (B., S.A.M., P., B.H.); between Kaientes and Kaross, *Thorne* (S.A.M.); Kaurasib River west of Otavi, *Barnard* (S.A.M.); Wilhelmsdal, Okahambia, *Dinter* 563 (B.); Toles River, *Dinter* 2085 (B.); Namaqualand: Namib bei Klawami, *Belek* 54 B (B.); no definite locality, *Dinter* 1410 (B.).

30. ***T. zoutpansbergensis*** Bremekamp in Ann. Tvaal. Mus. 15.2.242 (1933); Bothalia 3.2.239 (1937).

Type specimen, *Bremekamp* and *Schweickerdt* 279, in Herbarium, Transvaal Museum, Pretoria.

Suffruticose, stems erect, densely sericeo-pubescent. *Leaves* 2-4-jugate, petiolate, petioles 1.5-2 cm. long; terminal leaflet shortly petiolate, petiole 3 mm. long; leaflets broadly lanceolate or oblanceolate, 1.5-4.5 cm. long, 0.5-1.5 cm. broad, base acute, apex obtuse, mucro minute, recurved, sericeous when young, sparsely pubescent when older;

common petiole 2-4.5 cm. long, stout. *Stipules* filiform, pubescent, 2-4 mm. long. *Racemes* terminal, densely many-flowered, flowers binate, lower in axils of reduced leaves (1-2-jugate or simple), others in axils of deciduous filiform bracts, both rhachis and calyces densely sericeous-villous. *Flowers* 1.5 cm. long, shortly pedicellate, pedicels with minute bracteoles. *Calyx*-tube campanulate, 1 cm. in diam., 3 mm. long, lobes subulate to subulate-ovate, unequal, 1.7-8 mm. long. *Vexillum* unguiculate, reniform, pubescent without, 1-1.4 cm. broad. *Ovary* sericeo-villous, 8 mm. long. *Style* dorsiventrally flattened, inconspicuously glandulose, 4-4.5 mm. long, stigma penicillate. *Legume* ovoid or oblong, 1.2-1.5 cm. long, 6-7 mm. broad, obliquely apiculate, densely pubescent.

TRANSVAAL.—Zoutpansberg district: Zoutpan, Zoutpansberg, *Bremekamp* and *Schweickerdt* 279 (P., T.M.); lower slopes of Zoutpansberg, *Obermeyer*, *Schweickerdt* and *Verdoorn* 174 (K., P., T.M.); Waterpoort, *Rogers* (T.M.).

31. ***T. griseola*** H. M. Forbes sp. nov., affinis *T. zoutpansbergensi* Bremekamp, sed foliis 1-2-jugatis, foliolis supra pallido-viridibus, pedunculis laxe-floris differt.

Suffrutex circiter 13-23 cm. altus, canescens. *Folia* 1-2-jugata, nonnumquam unifoliata; foliola oblanceolata, mucronata, 2-4 cm. longa, 0.6-1 cm. lata, supra glabrescentia, subtus canescentia; stipulae lineares, 2-5 mm. longae. *Pedunculi* laxiflorae, 6.5-10.5 cm. longi; bractae 3 mm. longae; pedicelli 4-5 mm. longi. *Flores* 1.5 cm. longi; dentes calycis tubo excendentibus, subulato-acuminati; ovarium 1 cm. longum, pilosum; stylus 5 mm. longus, complanatus, penicillatus.

SOUTH WEST AFRICA.—Cayimaeis, *Thorne* (S.A.M. 31721) Type in South African Museum Herbarium.

Suffruticose, about 13-23 cm. high, whole plant more or less canescent. *Leaves* 1-2-jugate or sometimes simple, rhachis of pinnate leaves 1.5-2.5 cm. long, 0.9-1.5 cm. long before first pair of leaflets, petiole of simple leaves 5-6 mm. long; leaflets glabrous and pale green above, thinly canescent below, oblanceolate, mucronate, 2-4 cm. long, 0.6-1 cm. broad. *Stipules* linear, 2-5 mm. long. *Peduncles* 6.5-10.5 cm. long, laxly flowered, 1-2 flowers together at intervals of 2.5-3 cm., 1-2 flowers together in axils of upper leaves; bracts 3 mm. long; pedicels 4-5 mm. long. *Flowers* 1.5 cm. long. *Calyx* pubescent, tube 3 mm. long, lobes subulate, acuminate, 4 mm. long. *Vexillum* orbicular, 1.5 cm. long and broad. *Ovary* 1 cm. long, pilose. *Style* 5 mm. long, complanate, penicillate at apex. *Legumes*, immature, densely pubescent.

32. ***T. purpurea*** (L.) Pers. Syn. Pl. 2.329 (1807); DC. Prod. 2.251 (1825); G. Don. Syst. Nat. 2.230 (1832); Bak. in Oliv. Fl. Trop. Afr. 2.124 (1871); Bak. in Hook. f. Fl. Brit. Ind. 2.112 (1876); Ficalho and Hiern. in Linn. Soc. Ser. 2.2.19 (1881); Mildbraed in von Micklenberg Deuts. in Afr. Exped. 1907-8 2.254 (1911); Fries in von Kosen Schwed. Rhod. Congo Exped. 1911-12 1.84 (1914); De Willd. in Bull. Soc. Bot. Belg. 57.2.124 (1925); Bothalia 3.2.239 (1937).

Syn. *Galega purpurea* Linn. Syst. Nat. 2 Editio Decimo Reformato 1172 (1759); Linn. Syst. Nat. 2 Ed. XII 497 (1767); *Cracca purpurea* Linn. Sp. Pl. Edit. 1.752 (1753). *Cracca purpurea* (L.) O. Ktze. in Hiern Cat. Afr. Pl. Welw. 1.218-225 (1896).

Type specimen, sheet No. 7, in Linnean Herbarium, Burlington House, London.

A copiously branched perennial 1-2 ft. high. *Stems* slender, firm, subglabrous. *Leaves* 7-9-jugate or 13-17-jugate, 5-9 cm. long; leaflets 1.8-2.5 cm. long, 0.5-2 cm. broad, oblanceolate, apex blunt, mucronate, sub-coriaceous, both sides grey-green, upper glabrous, lower pubescent or nearly glabrous. *Stipules* linear to linear-subulate, 4-8 mm. long. *Peduncles* terminal and leaf-opposed, 7.5-15 cm. long, laxly 6-20 flowered. *Flowers* up to 8 mm. long, pedicellate, red-purple. *Bracts* linear 2-4 mm. long. *Calyx* silky, teeth lanceo-

late-acuminate, exceeding the tube in length. *Style* glabrous, penicillate at apex. *Legumes* linear, slightly recurved, glabrous or softly pubescent, 1.8–2.5 cm. long, 0.4–0.5 cm. broad, 6–10 seeded:

SOUTH WEST AFRICA.—Namakunde, *Rautanen* 511 (Pa., V., Z., B.); Olukonda, *Schinz* 563 (B.); Otavi, *Dinter* 5771 (D. Coll.); Tsumeb, *Dinter* 7466 (D. Coll.).

TRANSVAAL.—Zoutpansberg district: Zoutpansberg, *Schweickerdt* and *Verdoorn* 543 (P., T.M.); Messina, *Rogers* 20988 (Z.).

T. purpurea is a very widely distributed species occurring in all parts of the tropics. In Africa it extends throughout tropical and central Africa, South West Africa, Rhodesia and the northern Transvaal. From the material seen it appears to be a very variable plant. The specimen, "Sheet No. 7" in the Linnean Herbarium, which is said to be the type, does not agree with the early descriptions, as it appears to be a much smaller plant.

The following is an extract from Wight and Arnott *Prod. Fl. Pen. Ind. Or.* 1.213 (1834):—

"The supposed type of this species has the whole plant, especially the stems and legumes, almost glabrous, but we have observed so many transitions between that state and those in which the stems might almost be called villous, and the legumes decidedly pubescent, and forms as variable as the soil in which this species is found, that we have been induced to neglect the pubescence as a character insufficient to mark a variety."

References are also made to the more or less pubescent forms and to the densely pubescent or slightly villous forms which had been cited under different species.

In India the plant is used medicinally by Indian doctors.

33. *T. Evansii* Hutch. and Burt Davy in *Fl. Tvaal.* 1.2. p.p. XXXI. 378 (1932).

Type specimen *Pole-Evans* H. 16853. in Herbarium, Kew.

An erect slender branching plant. *Stems* softly pubescent with greyish hairs. *Leaves* 6–9-jugate, 4.5–10 cm. long; leaflets oblanceolate, thinly pubescent above, more densely pubescent below, mucronate, 1–3 cm. long, 4–9 mm. broad. *Stipules* linear-lanceolate, 5–6 mm. long. *Peduncles* terminal, 17–25 cm. long, more or less laxly racemously flowered. *Flowers* 2–4 together, often in the axils of the upper leaves. *Calyx* tube 3 mm. long, 6–9 mm. in diam., lobes triangular-subulate, 3–5 mm. long. *Verillum* 1.1 cm. long, 0.9–1 cm. broad, pubescent without. *Style* 3–4 mm. long, glabrous, penicillate at apex. *Legumes* 3–4 cm. long, 3–4 mm. broad, slightly falcate, densely and softly tomentose.

TRANSVAAL.—Barberton district: Komatipoort, *Pole-Evans* H. 16853 (K.); *Schlechter* 11763 (K., B.M., P., G., Z., V., B., B.H., A.M.); *Dyke* [Marloth Herb. 5502] (P.); Godwan River, *Rogers* 22651 (P.); White River, *Rogers* 20097 (P.); Nelspruit, *Thorncroft* 2108 (P.).

34. *T. transvaalensis* Hutch. and Burt Davy in *Fl. Tvaal.* 1.2 p. XXXII and 378 (1932); *Ann. Tvl. Mus.* 17.4.204 (1937).

Type specimen, *Schlechter* in Herbarium, Kew.

Suffruticose. *Stems* erect, densely pilose-pubescent. *Leaves* 3–8-jugate, 4–6.5 cm. long; leaflets 2–4.5 cm. long, 3–6 mm. broad, narrow-oblong or oblanceolate, mucro short, recurved, glabrous above, softly appressedly cinereo-pilose below. *Stipules* narrow, 5–7 mm. long, 3-nerved. *Peduncles* 8–14 cm. long, terminal and leaf-opposed, laxly racemose; flowers usually in pairs. *Flowers* 7–8 mm. long; bracts 2–5 mm. long, narrow. *Calyx*-tube 2 mm. long, 5 mm. in diam., lobes 2–5 mm. long, narrow triangular-subulate, pilose

without. *Style* 3-4 mm. long, glabrous, flattened, penicillate at apex. *Ovary* 4 mm. long, pubescent. *Legumes* 4 cm. long, 4 mm. broad, flat, apex slightly falcate, thinly and shortly pubescent.

BECHUANALAND PROTECTORATE.—Mochudi, Harbor [Rogers 6881] (Z.).

TRANSVAAL.—Lydenburg district: Komatipoort, Schlechter 11783 (B.H., Pa., A.M.).

35. *T. inandensis* H. M. Forbes sp. nov., affinis *T. grandiflorae* (Ait.) Pers., sed stipulis subulatis differt.

Suffrutex caulibus erectis. *Caules*, pedunculi, petiolique dense pubescentes demum glabrescentes. *Folia* 6-7-jugata, 6-11 cm. longa; foliola cuneato-oblonga, retusa, mucronulata, 2.5-4 cm. longa, 1-1.5 cm. lata, supra glabra, subtus pubescentia; stipulae subulato-acuminatae, usque ad 1 cm. longae; pedunculi usque ad 7 cm. longi, terminales vel axillares; bractee ovato-acuminatae, mox caducae; pedicelli usque ad 1 cm. longi, pubescentes. *Flores* 2 cm. longi; calyx pubescens, dentes calycis lanceolato-acuminati tubo aequilongi sed uno longiore; stylus pilosus.

NATAL.—Inanda district: Wood 289, Inanda, Type in Natal Herbarium, Durban.

Suffruticose. *Stems* erect, with stems, peduncles and petioles densely pubescent, but becoming glabrous at length. *Leaves* petioled, 6-7-jugate, 6-11 cm. long; leaflets cuneate-oblong, retuse, mucronulate, glabrous above, pubescent below, 2.5-4 cm. long, 1-1.5 cm. broad. *Stipules* subulate, acuminate, up to 1 cm. long. *Peduncles* terminal and axillary, up to 7 cm. long. *Bracts* ovate-acuminate, soon caducous. *Flowers* 2 cm. long, "rosy", pedicels up to 1 cm. long, pubescent. *Calyx* pubescent, four lobes equalling the tube in length, lowest much longer. *Ovary* shortly and densely pubescent along margins. *Style* bearded. *Legumes* not seen.

Only one specimen of this plant is in the Natal Herbarium. It appears to be an erect shrubby plant.

36. *T. otaviensis* Dinter in Fedde Rep. 30. 204 (1932).

Type specimen, Dinter 5747, in Dinter's Private Herbarium.

A perennial, many-stemmed, woody, erect shrub up to 70 cm. high. *Stems* terete, thinly appressedly pubescent, branches long. *Leaves* 3-6 cm. long, petioles about 7 mm. long, 3-6-jugate; leaflets 2.5-7 cm. long, 0.5-1.2 cm. broad, oblong, shortly mucronate, midrib prominent, glabrous above and closely appressedly grey-hairy below; petiolules about 1.5 mm. long, very hairy, rotund, with a round glabrous gland on the under-surface. *Stipules* subulate, 2-nerved. *Peduncles* about 15 cm. long, angular, grooved; inflorescence rigid, laxly flowered, about 10 cm. long. *Flowers* single or two together, pale mauve; pedicels 2.5 mm. long, shortly and densely hirsute; bracts stiffly erect, awl-shaped. *Calyx* broadly campanulate, tube 9 mm. in diam., 3.5 mm. long, two upper lobes 2 mm. long, three lobes 3 mm. long, all lobes 1-1.5 mm. broad, whole calyx thickly hairy with short brownish hairs. *Vexillum* hairy without, 1.8 cm. long, 1.4 cm. broad. *Ovary* 1.3 cm. long, densely silky. *Style* 4 mm. long, bearded. *Legume* linear, 13-15 seeded, 5.5-8 cm. long, 5-5.5 mm. broad, densely white hirsute.

SOUTH WEST AFRICA.—Otavi, Dinter 5747 (D. Coll., B., G., Pa., B.H., N., Kim.) Bei Bobos in lichten sandigen Buschvelde, Dinter 7570 (K., D. Coll., B.).

37. *T. lactea* Schinz in Vierteljahrsschr Nat. Ges. Zurich 52.425 (1907).

Type specimen, Rautanen 530, in Botanisches Museum, Zurich.

Suffruticose, branches cinereo-holosericeous. *Leaves* 7-14-jugate, 6-14 cm. long; leaflets 1.2-2.5 cm. long, 0.4-0.8 cm. broad, oblong-obovate, apex rotund or emarginate,

mucronate, base cuneate acute, glabrous above, lacto- or cinereo-holosericeous below. *Stipules* 2.5 mm. long. *Peduncles* terminal, 8–30 cm. long, many-flowered. *Flowers* pedicellate, about 1.45 cm. long. *Calyx* holosericeous, tube about 3 mm. long, lobes triangular, lanceolate, 3–5 mm. long. *Vexillum* 1.4 cm. long, silky without. *Style* bearded. *Legumes* 4–5.5 cm. long, 4–5 mm. broad, sericeous.

SOUTH WEST AFRICA.—Hereroland: Epaho, in sandigen Boden, Halbkraut, *Rautanen* 530 (Z.); *Luderitz* 1 (Z.); Namaqualand: Sendlingsgrab, Rehlboth, *Fleck* 631 a (Z.); Namieb bei Khoianii, *Belek* 54 b (Z.).

38. ***T. tzaneenensis*** H. M. Forbes sp. nov., affinis *T. elongatae* E. Mey., sed foliis sessilibus vel breviter petiolatis differt.

Suffrutex caulibus erectis vel ascendentibus glabris vel parce pubescentibus; foliola 1–4-juga, linearia vel oblongo-linearia, 2–9 cm. longa, 0.5–2 cm. lata, subtus glabra vel parce pubescentia; stipulae lineari-subulatae. *Pedunculus* 7.5–32 cm. longus; racemi laxiflorae. *Flores* 1.3 cm. longi; dentes calycis tubo longiores. *Fructus* 5.5–7.5 cm. longus, 0.3 cm. latus, parce pubescens.

Type specimen, *Pole-Evans* 4024, in National Herbarium, Pretoria.

Suffruticose, stems erect or ascending, glabrous or appressedly pubescent. *Leaves* 1–4-jugate, sessile or subsessile, common petiole 1.6 cm. long; leaflets linear to oblong-linear, 2–9 cm. long, 0.5–2 cm. broad, glabrous on both sides or sparsely appressedly pubescent below. *Stipules* linear-subulate, 2–6 mm. long. *Peduncles* terminal or leaf-opposed, laxly racemously flowered, 7.5–32 cm. long; flowers 2–4-nate, 1.3 cm. long; pedicels 1 cm. long, pubescent. *Calyx* pubescent, tube 2.5 mm. long, lobes 3–5 mm. long, upper lobes connate for almost entire length; vexillum about 1.3 cm. long, 1 cm. broad. *Ovary* 4 mm. long, pubescent. *Style* 2.5 mm. long, flattened, glabrous. *Legumes* 5.5–7.5 cm. long, 0.3 cm. broad, many seeded, sparsely appressedly pubescent.

TRANSVAAL.—Pietersburg district: Tzaneen, *Pole-Evans* 4024, (P., B.H.); *Mogg* (K.); *Rogers* 12400 (K., P., N., W., Z.); *Phillips* 3292 (P.); Haenertsberg, *Moss* and *Rogers* (K.); The Downs, Pietersburg, *Rogers* 21953 (B.M., Z., W., T.M.); Thabina, *Pole-Evans* H 15803 (K.); Duivel's Kloof, *Mogg* H 10719 (P.); Weltevreden, *Grant* (P.); Pusela, *McCallum* (P.); Shiluwane, *Junod* 632, 761, 2310 (G.); Northern Transvaal, *Le Dour* 43 (A.M.).

This species is similar in appearance to *T. elongata* but is readily distinguished by the sessile or very shortly petioled leaves.

39. ***T. elongata*** E. Mey. Comm. Pl. Afr. Austr. 111 (1835); Sond. in Linn. 23.30 (1850); Harv. in Harv. and Sond. Fl. Cap. 2.208 (1861–62); Wood Fl. Natal 42 (1907); Wood in Trans. S. A. Phil. Soc. 18.2.147 (1903); Ann. Tvl. Mus. 3.3.147 (1912); Bews Fl. Natal and Zululand 111 (1921); Burt Davy Fl. Tvaal. 1.2.378 (1932).

Syn. *T. aurantiaca* R. G. N. Young in Ann. Tvl. Mus. 14.4.398 (1932).

Type specimen, *Drège* s.n., in Botanisches Museum, Berlin-Dahlem.

Suffruticose. *Stems* ascending from the base, erect, subangular, flexuous, glabrous or pubescent, up to 60 cm. long. *Leaves* 1–2-jugate, lower occasionally simple, common petiole 1.1–5.5 cm. long; leaflets linear-lanceolate, glabrous or pubescent, mucronate, 4.7–9 cm. long, 0.6–1.2 cm. broad. *Stipules* subulate-acuminate, 4–8 mm. long. *Peduncles* 6–20 cm. long, laxly racemously flowered. *Flowers* up to 1.3 cm. long; pedicels 2–4 mm. long. *Calyx*-lobes about equalling the tube in length. *Ovary* 6.5 mm. long, pubescent. *Style* glabrous. *Legumes* 5.6 cm. long, 0.3–0.4 mm. broad, pubescent or glabrescent.

Natal:— in clivis circa Clydesdale, *Tyson* 2052 (K., H.B.); in graminosis olivis Clydesdale ad flumen Umzimkulu, and Umkomaas, *Drège* (B.); Durban district: on Durban Flat, *Wood* (N.); near Durban, *Wood* 5586 (G., V., P.); *Wood* 149 (B.M., G., B.); Umbilo, *Wood* (N.); Inanda district: Inanda, *Wood* 1230 (K.); Pinetown district: Pinetown, *Rogers* 2811 (Z.); Umgeni district: near Howick, *Wood* 5226 (G., Z., B.); Vryheid district: Lancaster Hill, *Burt Davy* 11422 (P.); *Galpin* 9767 (K., P.); Vryheid, *Burt Davy* 11472 (P.); Utrecht district: amongst rocks on granite outcrops, Paulpietersburg, *Galpin* 10884 (K., P.). No definite locality, *Gerrard* and *McKen* (Pa., V., N.).

TRANSVAAL.—Heidelberg district: *Leendertz* [T.M. 7733] (T.M.); Lichtenburg district: Grasfontein, *Sutton* 399 (P.); Potchefstroom district: Potchefstroom, *Jenkins* (T.M.); Welverdiend, *Moss* 20491 (W.); Krugersdorp district: Klip River, Krugersdorp, *Fry* 3 (P.); Johannesburg district: Kopje, Park View, Johannesburg, *Moss* 8887 (W.); *Leendertz* 6056 (T.M.); Jeppes Ridge, *Gilfillan* 26 and 52 A (P.); Milner Park, *Moss* 10583 (B.M., W.); *Moss* 14012 (W.) [Type of *T. aurantiaca* R. G. N. Young]; dry veld, Johannesburg district, *Ommanney* 81 (B.M.); Mulders Drift, *Moss* 13634 (B.M.); Witwatersrand, *Hutton* (A.M.); Modderfontein, *Haagner* (A.M.); Elsberg, *Rogers* 12138 (W.); on veld near Boksburg, *Murray* (P.); Benoni, *Bradfield* 289 (P.); Carolina district: stony slope on farm Bergendal, Carolina, *Galpin* 12499 (K., P., G., B.) Waterval Boven, *Mason* 40 (W.) and *Rogers* 14424 (Z.); Barberton district: in monte Sheba pr. Barberton, *Bolus* 7726 (B.H.); Pretoria district: S. slopes Meintjies Kop, Pretoria, *Mogg* 16522 (P.); Bryntirion, *Smith* 3347 (K., P.); dry lands, Groenkloof, *Phillips* 3059 (P.); Vaal rivier und Magaliesberg, *Zeyher* 335 and 457 (K., B.M., Pa., A.M., S.A.M.); Magaliesberg, *Burke* (K., Z., Pa.); Premier Mine, *Rogers* 15653 (B.H.); Marico district: on hillside, Marico, *Oberholzer* S. 34 (B.); Rustenburg district: Rustenburg, *Leendertz* 3471 (T.M.); Lydenburg district: Burtplaatz bei Lydenburg, *Wilms* (G.); Farm Zwagershoek, *Obermeyer* 197 (T.M.); Spekboom River, 4 miles N. of Lydenburg, *Young* A 459 (T.M.); bei der Stadt, Lydenburg, *Wilms* 401 (B.M., Pa., G., V., Z., B.); Pietersburg district: Kratzenstein, Woodbush, Pietersburg, *Hoffman* 62 (T.M.); in montibus saxosis Houtbosch, *Bolus* 11070 (H.B.); Houtbosch, *Rehmann* 6233 (K.); Shiluwane, *Junod* 1404 (G.); no definite locality, Vaal River, *Burke* 336 (Pa.); Spitzkop Goldmines, *Wilms* 402 (B.M., G., Z.); *Barber* 659 (A.M.); *Zeyher* (B.); *Drège* 456 (V.).

Var. pubescens E. Mey. Leaflets, stems and legumes pubescent.

NATAL.—Port Natal: *Peddie* (K.); Durban district: *Rogers* 1496 (W.); Umgeni, *Thode* A. 3117 (S.); Inanda district: Kearsney, *Milner* (N.); Inanda, *Wood* 351 (K., B.M., S.A.M.); Pinetown district: New Germany, *Thode* (S.); Warrook, *Thode* (S.); pr. Krantzklouf, *Schlechter* 3214 (Z., B., G., B.); no definite locality, *Gerrard* 1110 (K., B.M., Pa., V.).

SWAZILAND.—Grassy hills near Dalriach, *Bolus* 11817 (P., B.H., A.M.); Hlatikulu, *Stewart* (T.M.).

TRANSVAAL.—Krugersdorp district: Witpoortjie Kloof, *Moss* 7472 (W.); Johannesburg district: Turffontein, *Weeks* (W.); Pretoria district: S. slope of Meintjies Kop, Pretoria, *Smith* 3290 (P.); slope of Meintjies Kop on N.E. side, *Smith* 759 (P.); Doornkloof, *Pole-Evans* 1031 (P.); Fountains Valley, *Repton* 255 (P.); Baviaanspoort, *Smith* 1060 (P.); Wonderboompoort, *Smith* 1740 (P.); Kopje, Pretoria, *Moss* 10514 (W.); colles supra Aapies River, Pretoria, *Rehmann* 4394 (K., B.M., Z.); Koedoespoort, *Mogg* (P.); Premier Mine, *Rogers* 25054 (Z.) and 18944 (W.); Boekenhouts Valley, *Jenkins* (T.M.); Lydenburg district: Godwan River Stn., *Davison* and *Hofmeyer* 107 (P.); Barberton district: Eastern slopes, Saddleback Mtn., *Galpin* 1146 (K., P., A.M.); White River, Barberton, *Rogers* 23491 (Z.); Nelspruit, *Breyer* (T.M.); at Schagen, Nelspruit, *Liebenberg* 3300 and 3300A (P.); on top of Mt. Schagen, *Liebenberg* 2473 (P.); no definite locality, Rooker Sanatorium, *Junod* 908 (G.); Transvaal. S.A. Botanical Tour, *Hutchinson* 2335 and 2559 (K.).

In "Annals of the Transvaal Museum", 14.4.398 (1932), Mr. R. G. N. Young described a new species, *T. aurantiaca*. I have examined his material and can find no grounds for removing it from *T. elongata*. The colour of the flowers, which he gives as a "deep orange-brown", is not a reliable character on which to separate it, as in *T. elongata* the colour of the flowers, according to collectors' notes, varies from vermilion-red to deep orange-red.

Should further collections prove Mr. Young's plant to be worthy of specific rank, another specific name will have to be given it, the name "*aurantiaca*" being invalid, as it has already been used by Harms for a *Tephrosia* described by him in Engl. Jahrb. XXVIII. 402.

40. *T. angustissima* Engl. Bot. Jahrb. 10.29 (1888).

Type specimen, *Marloth* 1086, in Botanisches Museum, Berlin-Dahlem.

Stems elongate, ascending, slender; stems and lower surface of leaves appressedly sericeo-pilose. *Leaves* 2-3-jugate, 2-6.5 cm. long, petiole 2-4.5 cm. long before first pair of leaflets; leaflets narrow linear-lanceolate, margins cartilaginous, apex acute, 2-5 cm. long, 0.2-0.3 cm. broad. *Stipules* linear-subulate, brown, 4-5 mm. long. *Peduncles* terminal, 8-20 cm. long, densely flowered above; bracts 4-6 mm. long, subulate, brown; pedicels 3-5 mm. long; flowers 1.3 cm. long. *Calyx* densely pilose, teeth deltoid, subequal in length to tube. *Style* bearded. *Legume* narrow linear, flat, apiculate, 5-6 cm. long, 3 mm. broad, many seeded.

BECHUANALAND.—Pr. Kuruman, in summo montium "Ga Mhana", *Marloth* 1086 (B., P., A.M., S.A.M., B.H.).

Engler remarks: "It is near *T. lurida*, which, however, has longer leaflets and fewer flowers."

Apparently this plant has only been collected once. Further collectings may prove that it is merely a form of *T. lurida*.

41. *T. lurida* Sond. in Linnaea 23.30 (1850); Harvey in Harv. and Sond. Fl. Cap. 2.208 (1861-62); O. Kuntze Rev. Gen. Pl. 1.175 (1891); Burt Davy and Pott in Ann. Tvl. Mus. 3 3.146 (1912); Bak. f. Leg. Trop. Afr. 1.200 (1926); Bot. Survey of S.A. Mem. 12.68 (1928); Young in Ann. Tvl. Mus. 14.4. 402 (1932); Burt Davy Fl. Tvaal. 1.2.378 (1932); Watt and Breyer-Brandwyk Med. and Pois. Pl. S.A. 74 (1932).

Syn. *Cracca lurida* (Sond.) O. Ktz. Rev. Gen. Pl. 1.175 (1891); O. Ktz. Rev. Gen. Pl. 3.2.57 (1893).

Type specimen, *Zeyher* 456, in Herbarium, Kew.

Suffruticose. *Stems* erect, branches ascending from the base, angular, hispid. *Leaves* 1-4-jugate, very rarely simple leaves present, up to 13 cm. long, length of petiole before first pair of leaflets 1-7.5 cm. long; leaflets elongate-linear, mucronate, glabrous above, appressedly pubescent below, midrib prominent, lutescent, 2-12 cm. long, 1-9 mm. broad. *Stipules* setaceo-subulate, 0.8-1.3 cm. long. *Peduncles* up to 30 cm. long, few flowered towards the apex. *Flowers* 1.5 cm. long. *Calyx* sericeous without, lobes acuminate, longer than the tube. *Vexillum* sericeous without. *Style* flattened, bearded. *Legume* linear, compressed, lurido-tomentose, many seeded, 7-8 cm. long.

TRANSVAAL.—Potchefstroom district: Potchefstroom, *Goossens* 1460 (B.); Ventersdorp, *Sutton* 576 (Pa.); Marico district: Zeerust, *Leendertz* (T.M.); *Jenkins* (S.A.M.); Thode A 1393 (P., N.); Lichtenburg district: Lichtenburg, *Jenkins* (T.M.); Grasfontein, *Sutton* 299 (P.); Klipveld, *Liebenberg* 79 (P.); Heidelberg district: Heidelberg, *Thode* A 1308 (P.); *Leendertz* 2455 (T.M.); Witwatersrand district: Natal Spruit, Johannesburg, *Bryant* D 81 (P.); Observatory Ridge, *Burt Davy* 18896 (K.); Jeppestown, *Galpin* 1379

(K., A.M.); Jeppes Ridge, *Galpin* 1499 (P., A.M.); Kopjes, Houghton Ridge, *Moss* 2274 and 2741 (W.); Kopjes, *Omanney* 24 and 28 (B.M.); open veld, Johannesburg, *Rand* 843 (B.M.); Witwatersrand, *Hutton* 887 (Z.); Benoni, *Bradfield* 269 (P.); Krugersdorp district: Witpoortjie, *Moss* 8361 (W.); Krugersdorp, *Jenkins* (T.M.); Pretoria district: Irene, *Rogers* 23806 (Z.); Aapies River pr. Pretoria, *Bolus* 10833 (K., A.M., G.B.); Fountains Valley, *Repton* 127 (P.); N.E. slopes of Curtis Hill, *Pole-Evans* 110 (K.); Sunnyside, *Goossens* 107 (P.); Waterkloof, *Verdoorn* 31 (P.); Arcadia, *Burt Davy* 2433 (P., B.H.); Meintjies Kop, *Bolus* 11818 (B.H.); along N. slopes of hill near Union Buildings, *Smith* 1295 (Z., P.); near Trichardts Poort, *Smith* 3467 (P.); Wonderboompoort, *Smith* 6190 (P.); *Rehmann* 4611 (K., Z., B., B.H.); Groenkloof, *Burt Davy* 14631 (P.); Koedoespoort, *Obermeyer* (T.M.); Koppies, Pretoria, *Leendertz* (T.M.); Pretoria, *Pont* 793 (Z.); in saxosis Mt. Magaliesberg, Aapies R., *Schlechter* 3659 (B., A.M.); Magaliesberg, *Burke* (B.M., G., K., P.); *Zeyher* 456 (K., B.M., S.A.M.); Magaliesberg and Mooi R., *Zeyher* 182 (S.A.M.); ad Mooi R., Magaliesberg, Premier Mine, *Rogers* 19832 (Pa.); *Rogers* 14726 (N.A.M.); Rustenburg district: Waterkloof, *Collins* (T.M.); Rustenburg, *McClelland* (G.U.C.); *Nation* 58 (K., B.H.); *Rogers* 23577 (Z.); Vlakfontein near Rustenburg, *Liebenberg* 144 (P., G.); Waterberg district: Mosdene, Naboomspruit, *Galpin* M 87 and M 628 (P.); near Ypres Halt, *Schlechter* 11581 (B.H.); Leeuwpoort, *Rogers* 22792 (Z.); Carolina district: Waterval Boven, *Mason* 38 (K., W.); Godwan River, *Rogers* 22650 (K., Pa., T.M.); Barberton district: Pilgrims Rest, *Greenek* (B.M.); Barberton, *Galpin* 697 (B.H., Z.); Kaap Valley, *Galpin* 759 (N., A.M., Z.); Lydenburg district: bei der Stadt, Lydenburg, *Wilms* 401 b (Pa., B.); *Wilms* 401 (K., Pa.); Pietersburg district: in graminosis pr. pagum Pietersburg, *Bolus* 11069 (B.H.); Houtbosch, *Rehmann* 6235 (K., Z.); Waterberg district: Makapansberge, Streydport, *Rehmann* 5544 (Z.).

RHODESIA.—Matopos, Bulawayo, *Rogers* 5682 (B.H., S.A.M., T.M.); Bulawayo, *Eyles* 1206 (P., S.A.M., B.); Salisbury, *Eyles* 2170 (Pa., P., S.A.M.); Mazoe, *Eyles* 265 (B.H.).

The Zulu name for this species is "iShoba-lehashi". A cold infusion of the root is mixed with an infusion of *Dianthus crenatus* and the froth is used for washing the face so as to attract the attention of the opposite sex. As a further measure, some of the liquid is also drunk.

42. **T. longipes** Meisn. Hook. Lond. Journ. Bot. 2.87 (1843); Cape Plants, Krauss and Engler, 54 (1846); Walpers Rep. Bot. Syst. 5.515 (1846); Harvey in Harv. and Sond. 2.208 (1861–62); Baker in Oliv. Fl. Trop. Afr. 2.120 (1871); Grant and Oliv. in Trans. Linn. Soc. Lond. 29.56 (1872); Ficalho and Hiern. in Trans. Linn. Soc. Bot. Ser. 2.2.19 (1881); O. Kuntze Rev. Gen. Pl. 1.175 (1891); Wood Fl. Natal 42 (1907); Wood in Trans. S.A. Phil. Soc. 18.2.147 (1908); Burt Davy and Pott in Ann. Tvl. Mus. 3. 3.146 (1912); Bews Fl. Natal and Zululand 111 (1912); Baker f. in Leg. Trop. Afr. 1.199 (1926); Young in Ann. Tvl. Mus. 14.4.398 (1932); Burt Davy Fl. Tvaal. 1.2 (1932).

Syn. *Cracca longipes* O. Kuntze Rev. Gen. Pl. 1.175 (1891).

Type specimen, *Krauss* 20, in Herbarium, Kew.

Suffruticose. Stems erect, branching, angular, subcanescent. Leaves 2–8-jugate, 5–13 cm. long, length of petiole before first pair of leaves 1–4 cm.; leaflets 1.5–11 cm. long, 2–7 mm. broad, narrow linear, usually complicate, mucronulate, glabrous above, argenteous beneath. Stipules setaceo-subulate, 0.4–1 cm. long. Peduncles terminal, up to 50 cm. long. Flowers about 1.7 cm. long, few in remote fascicles; pedicels and bracts 3–5 mm. long. Calyx fulvo-pilose without, tube 7–8 mm. in diam., 2.5 mm. long, lobes narrow, acuminate, unequal, 1–4 mm. long. Vexillum densely fulvo-pilose without, 1.6 cm. long, 1.2 cm. broad. Ovary densely silky. Style bearded. Legumes flat, linear, 3.5–7.5 cm. long, 4 mm. broad.

NATAL.—Durban district : Port Natal, *Krauss* 20 (K., G., O.); *Gueinzus* 308 (K., V.); *Krauss* s.n. (V.); *Zeyher* (Z.); near Durban, *Wood* 9565 (B., S.A.M.); Umzinyati Falls, *Wood* 1202 (K., B.M., N., B.H., S.A.M.); Umlaas, *Evans* 327 (N.); Lower Tugela district : Ntondweni, *Wood* 9214 (P.); near Tugela River, *Wood* (S.A.M., G., B.); no definite locality, *Gerrard* (P.).

PORTUGUESE EAST AFRICA.—Ad sinum Delagoa, *Forbes* 134 (K., Pa.); Delagoa Bay, *Monteiro* (K.); Lourenço Marques, *Schlechter* 11580 (K., B.M., Pa., G., V., Z., N., P., A.M., G., B.).

A note on the specimen collected by Mrs. Monteiro states : "The Kaffirs steep the leaves of this plant and rub them on the body to keep them in health when going a journey."

Var. *uncinata* Harv.

Leaflets obtuse, recurvo-mucronulate.

Type Specimen of the variety, *Zeyher* 455, in Herbarium, Kew.

TRANSVAAL.—Carolina district : Carolina, *Moss* and *Rogers* 1075 (Z.); Potchefstroom district : Holwater, Christiana, Bloemhof, *Burt Davy* 11239 (P.); Pretoria district : in nemorosis ad Aapies R., *Zeyher* 455 (K., B.M., Pa., G., Z., A.M., S.A.M.); Aapies and Orange Rivers, *Burke* (K.); in campis ad Magaliesberg and Vaal River, *Zeyher* 373 (S.A.M.); Magaliesberg, *Burke* (K.); colles supra Aapies R., *Rehmann* 4393 (K., B.M., Z.); Pretoria, *Leendertz* [T.M. 104] (T.M.); Meintjies Kop Range, Pretoria, *Smith* 3447 (P.); Wonderboompoort, *Smith* 6190 (K.); Barberton district : Louws Creek, *Thorncroft* 1154 (P.); Barberton, *Rogers* 29406 (Z.); Pietersburg district : Modjadjes, Pietersburg, *Rogers* 18129 (K.); Waterberg district : Kaalfontein, *Galpin* 13382 (P.); Nooitgedacht farm near Ypres Halt, *Galpin* 11518 (Pa., B.H.); Mosdene, Naboomspruit, *Galpin* M 85 (P.); Houtbosch, *Rehmann* 6234 (Z.); Zoutpansberg district : Zoutpansberg Range, *Smuts* (P.); no definite locality, *Rehmann* 4928 (Z.); *Drège* 455 (V.); *Junod* 1573 (G., Z.); *Holland* (Z.).

43. **T. multijuga** R. G. N. Young in Ann. Tvl. Mus. 14. 4. 402 (6th July, 1932.).

Syn.* *Tephrosia Woodii* Burt Davy Fl. Tvaal. 1.2.378 (28th July, 1932.).

Type specimens, *Moss* 7473 and *Young* 676, in Herb. Young in Witwatersrand University, Johannesburg.

Suffruticose. *Stems* ascending, 1-2 ft. high; branches slender, flexuous, sulcate, angular, sparsely patently or appressedly clothed with reddish hairs, or glabrescent. *Leaves* 2.5-5.5 cm. long, petiole long, 3-10-jugate; leaflets 0.7-2 cm. long, 1.5-4.5 mm. broad, narrow oblong-elliptic, acuminate, mucronate, glabrous above, thinly pubescent below, veining below usually dark reddish-brown. *Stipules* 2-7.5 mm. long, linear, setaceous. *Peduncles* 15-16 cm. long, usually laxly flowered. *Flowers* 7-8 mm. long, 1-3 together. *Calyx* tube 3.5-5 mm. broad, 1.5-2 mm. long, lobes 0.5-2 mm. long, deltoid acuminate. *Vexillum* 6.5-7.5 mm. long and broad, subrotund, canescent without. *Style* 2-3 mm. long, glabrous, penicillate at apex. *Legumes* 3.5 cm. long, 3 mm. broad, linear subfalcate, appressedly pubescent.

CAPE.—Eastern Province, Transkei : rocky slopes, Komgha, *Flanagan* 1139 (Z., P., A.M., B.H.); Kei River, *Drège* (K.) [Type of *T. Woodii* B. Davy]; Faku's Territory, *Sutherland* (K.); East Griqualand : ad rivos pr. "Clydesdale" ad flumen Umzimkulu, *Tyson* 2775 (K., Z., V., G., B., S.A.M.).

NATAL.—Umzinto district : in lapidosis pr. fl. Umkomanzi, *Schlechter* 6689 (B., A.M.); Durban district : pr. Durban, *Wood* 7523 (B.M., B.H.); Pinetown district : Emberton, *Schlechter* 3204 (Z., A.M.); Maritzburg district : Umlaas Drift, *Wood* 1887 (K., N., A.M., B.H.); Howick, *Franks* (N., T.M.); Weenen district : "Thorns" pr. Weenen, *Wood*

4477 (K., N.); Klip River district: Pieters pr. Ladysmith, Wood 6671 (K., Pa., N., P., S.A.M.); no definite locality, Gerrard 1073 (K., B.M., Pa., V., N.); Zululand: Entumeni, Wylie (N.).

ORANGE FREE STATE.—Bloemfontein district: Bloemfontein, Kuntze (B., K.); Kopje facing Tempe farm, Potts 2936 (K., P.); no definite locality, Cooper 2211 (K., Z.).

TRANSVAAL.—Standerton district: Standerton, Leendertz 4113b (T.M.); Potchefstroom district: Potchefstroom, Leendertz (T.M.); Klerksdorp, Convent 90 (A.M.); Maquassi Route, Liebenberg 3412 (K., P.); Krugersdorp, Jenkins (T.M.); Witwatersrand district: Witpoortjie Kloof, Witwatersrand, Moss 10802 (W.); and Moss 16195 (B.M., W.); Hill-sides, Jeppes Town, Galpin 1402 (K., P., A.M.); Houghton Ridge, Moss 7473 (W.); Johannesburg, Leendertz (T.M.); Rand 1146 (B.M.); Ommanney 27 (B.M.); Modderfontein, Conrath 231 (Z.); Pretoria district: Meintjies Kop, Mogg 14648 (P.); Bolus 11820 (B.H.); S. side of Meintjies Kop, Smith 2307 (P.); Kopjes south of Pretoria, Obermeyer (T.M.); Fountains Valley, Repton 212 (P.); Aapies Poort, Rehmann 4169 (Z.); near Pretoria, Moss 13255 (W.); Curtis and Bournes Hill, Pole-Evans 97 (K.); Crocodile River, Leendertz 723 (T.M., B.H.); Wonderboompoort, Smith 1739 (P.); Hartbeestepoort, Gillett 1075 (P.); Carolina district: Waterval Boven, Mason 34 and 34 A (K.); Carolina, Rogers 19117 (K., Z.); Barberton district: Nelspruit, Breyer (T.M.); van Elden 12 (P.); Rogers 21001 (P.); Barberton, Thorncroft (T.M.); Komati Poort, Schlechter 11804 (B., P., A.M., B.H.); Moss and Rogers 620 (K., Pa.); Rogers 20814 (K., G., Z.); Lydenburg district: bei der Stadt, Lydenburg, Wilms 363 (K., B.M., Pa., G., B., V.); Wilms 363b (G.); Waterberg district: Houtbosch, Rehmann 6236 (K., B.M.); Burtplaats bei Krugerspark, Wilms 363 a (K., B.M.); Blue Kranz River, 1895, Schlechter 6864 (B., P., A.M., B.H.).

SOUTH AFRICA.—No definite locality, Junod 162 (P.); Schlechter 3240 (Z.); Krook [Herb. Panther 2544] (V.); Thode (B.).

44. *T. semiglabra* Sond. in Linnaea 23.29 (1805); Harvey in Harv. and Sond. Fl. Cap. 2.205 (1861-62); O. Kuntze Rev. Gen. Pl. 1.175 (1891); Burt Davy and Pott in Ann. Tvl. Mus. 3.3.146 (1912); Ann. Bolus Herb. 3.1.20 (1920); Bot. Survey S.A. Mem. 12.68 (1928); Young in Ann. Tvl. Mus. 14. 4. 404 (1932); Burt Davy Fl. Tvaal. 1.2.378 (1932); Watt and Breyer-Brandwyk in Med. and Pois. PT S.A. 74 (1932).

Syn. *Cracca semiglabra* O. Kuntze Rev. Gen. Pl. 1.175 (1891).

Type specimen, Zeyher 459, in Herbarium, British Museum (Natural History), London.

Stems decumbent, arising from the base, up to 3 feet long, flexuous, clothed with rufous tomentum, angular. *Leaves* 3-6-jugate, 1.5-6 cm. long, shortly petiolate; leaflets oblong-lanceolate, recurved-mucronate, glabrous above, rufo-tomentose below, 1-2.5 cm. long, 0.5-1 cm. broad. *Stipules* subulate acuminate, 4-6 mm. long. *Peduncles* 7.15-20 cm. long. *Flowers* 0.9-2.3 cm. long, pedicels 0.4-1.2 cm. long. *Calyx* rufo-tomentose, tube 0.6-1.2 cm. diam., 2.5-4 mm. long, lobes lanceolate-acuminate, unequal, 1-3 mm. long. *Vexillum* 0.9-2.3 cm. long and broad, pubescent without. *Ovary* pubescent, 5-6 mm. long. *Style* glabrous. *Legumes* shortly pubescent, 3.5-4.5 cm. long, 3-4 mm. broad.

BECHUANALAND PROTECTORATE.—Mochudi, Harbor [Rogers 6500] (B.H., S.); Kuruman district: du Toit (G.U.C.).

CAPE PROVINCE.—East Griqualand: in graminosis clivis Clydesdale prope flumen Umzimkulu, Tyson 2783 (K., B., S.A.M., P., S.).

NATAL.—Pinetown district: Drummond, Franks (N.); Maritzburg district: near Maritzburg, Wood 3162 (K.); Newcastle, Wood 7191 (K., P., N.).

BASUTOLAND.—Leribe, Dieterlen 129 (K., Pa., N., P., S.A.M., A.M., Z.).

ORANGE FREE STATE.—Kroonstad district: *Pont* 328 (Z., P., G.U.C.); Viljoen's Drift, *Rogers* 4806 (B.M.); *Rogers* (T.M.); Bethlehem district: Dunelm Farm, Fouriesburg, *Potts* (K.); on slopes of hill near Little Caledon river, "Wyndford", Fouriesburg, *Gemmell* (G.U.C.); no definite locality, *Cooper* 2226 (K., Z.).

TRANSVAAL.—Vereeniging district: Vereeniging, *Bruyn* 163 (P.); Witwatersrand district: Jeppeshtown Ridge, Johannesburg, *Gilfillan* [Herb. Galpin 6100] (P., A.M.); *Holden* (T.M.); *Moss* 61715 bis (W.); grass-veld, Milner Park, *Moss* 6250 (B.M., W.); Mulder's Drift, *Moss* 13596 (W.); Klipriviersberg Range, *Rand* 1116 (B.M.); Observatory, *Weeks* 357 (W.); Modderfontein, *Conrath* 230 (Z., B.); on veld near Geduld Dam, Witwatersrand, *Murray* (P.); grass-veld, Rietfontein, *Moss* 16428 (W.); Kaalfontein, *Pole-Evans* H 13531 (K.); Pretoria district: in collibus lapidosis Aapies River pr. Pretoria, *Bolus* 10834 (K., B.H.); Irene near Pretoria, *Obermeyer* (T.M.); in grass near the Fountains Stn., Fountains Valley, *Repton* 195 (P.); Pretoria, *Smith* 1588 (P.); Commonage, Arcadia, *Smith* 1772 (P.); Riviera, *Smith* 1800 (Z., P.); Meintjies Kop, *Smith* 2305 (P.); in lapidosis ad ped. mont. Magaliesberg, *Zeyher* 459 (B.M., O., S.A.M.); Silverton, *Leendertz* 565 (T.M.); Hatherley, *Collins* (T.M.); Middelburg district: near Witbank, *Gilfillan* (P., A.M.); Carolina district: Leeuwpoot, Carolina, *Burt Davy* 7436 (P.); Farm Nooitgedacht, Ermelo, *Henrici* 1383 (P.); Dasal, Ermelo, *Hoffe* 9 (P.); Barberton district: Bushveld, Warmbaths, *Moss* 16584 (W.); Waterval Boven, *Mason* 34 (K.); Waterval Onder, *Jenkins* (T.M.); Saddleback Mtn., Barberton, *Galpin* 678 (Z., A.M., B.H., N., P.); Nelspruit, *Liebenberg* 2714 (P.); ridge to Pretorius Kop from White River, Lydenburg district: *Gillett* 1049 (P.); Farm Zwagershoek, Lydenburg district, *Obermeyer* 193 (T.M.); bei der Stadt, Lydenburg, *Wilms* 362 (B.M., G., V., B., T.M., B.H.); Mbabane, Swaziland, *Rogers* 11447a (B.H.).

PORTUGUESE EAST AFRICA.—In solo arenoso in colle pone Lourenço Marques, *Bolus* 7725 (B.H.).

South Africa.—No definite locality 1843, *Burke* (B.M., O.); in turfosis pr. Blackkopjes, *Schlechter* 4177 (K., B.M., Pa., V., G., B., B.H., A. M., T.M.).

The Suto name for *T. semiglabra* is "Pelo-di-marobaya-thaba". A decoction of the roots of this plant together with the roots of *Haplocarpha scaposu* is used in the treatment of chest colds.

45. **T. Burchellii** Burt Davy in Kew Bull. 50 (1921); Burt Davy Fl. Tvaal. 1.2.378 (1932).

Type specimen, *Burchell* 1932, in Herbarium, Kew.

Slender prostrate herb. Stems annual, arising from a perennial root-stock, 20–30 cm. long, flexuous, branching from the base. Leaves shortly petiolate, 5–8-jugate, 4–5 cm. long, rhachis hirsute with long hairs; leaflets 0.8–1.4 cm. long, 4–8 mm. broad, obovate, retuse, mucronulate, glaucous, ciliate, glabrous above, lower surface sparsely hirsute, chiefly along the veins. Stipules linear, 3–5 mm. long. Peduncles axillary, slender, 5–12.5 cm. long, laxly flowered. Flowers about 6 mm. long, 2–3 together. Calyx hirsute with long white hairs, tube about 1–1.5 mm. long, lobes narrow subulate, about 3 mm. long. Vexillum pubescent on the back. Style glabrous. Legumes 3–4 cm. long, 3–3.5 mm. broad, slightly falcate, appressedly puberulous.

SOUTH WEST AFRICA.—Ondonga, Amboland, *Rautanen* 644 (K., Z., V., G.); Okahandja, *Dinter* s.n. (D. Coll.); Farm Quickborn, Okahandja, *Bradfield* 60 (T.M.); *Dinter* 419 (B.); Omahehe, *Dinter* 25636 (B.); Leutueim, *Dinter* s.n. (B.); in river bed between Hoffnungs-fel/le and Hans, *Pearson* 9528 (K.).

BECHUANALAND PROTECTORATE.—Goruah, East Bamangwato Territory, *Holub* (K.); Batlapin Territory, *Holub* (K.); Mochudi, *Rogers* 6070 (K.); Harbor [*Rogers* 6590] (Z., P.); Harbor 985 (Kim.); Harbor s.n. (T.M.); Harbor [*Rogers* 6501] (P.); Harbor [*Rogers* 6500] (B.H.); Harbor [*Rogers* 6878] (P.).

CAPE PROVINCE.—British Bechuanaland: Vryburg district: Armoeds Vlake, *Mogg* 8686 (P.); *Sharpe* (P.); Sheppards Gift, *Burt Davy* 13749 and 13771 (P.); Experimental Farm, Vryburg, *Going* 7199 (P.); Takoon, *Burt Davy* 13965 (P.); Litaken, *Burt Davy* 13915 (P.); Griqualand West: Barkly West district: Daniels Kuil, *Wilman* (B.H.); Hardeveld, Priel, *Acocks* 1578 (Kim.); Hay district: Wildealsput, *Auchamp* 982 (Kim.); Griquatown, *Burchell* (K., Pa.); Bermolli, *Wilman* (K.); Kimberley district: Kimberley, *Marloth* 802 (P.); Karreeboom, Kimberley, *Wilman* 1366 (K., B.H., A.M., T.M.); in loose red sand, Karreeboom, *Wilman* 1366 bis (K., P., A.M., S.A.M., B.H.); Bushman's Fountain, *Wilman* (B.H.); Magersfontein, *Wilman* (T.M.); Reit Pan, *Reinhardt* 980 (Kim.) and *Wilman* (P.); Newlands, *Wilman* 3063 (Kim.); Herbert district: St. Clair, Douglas, *Orpen* 132 A (K.) and *Orpen* 133 (S.A.M.); Prieska district: Niekerk's Hoop, *Wilman* (P., K., T.M., A.M., B.H.); Krantz kop near Niekerk's Hoop, *Bryant* 1138 (P.).

ORANGE FREE STATE.—Boshof district: Karree Pan, *Wilman* 3327 (Kim.); Smitskraal, *Burt Davy* 10161, 11283, 11322, 11360, 12905 (P.).

TRANSVAAL.—Bloemhof district: Christiana, *Burt Davy* 11378, 12818, 14487 (P.); Wolmaransstad district: Wolmaransstad, *Rogers* 18470 (K.); Lichtenburg district: grass veld, Coligny, *Blenkiron* (W.); Potchefstroom district: Vereeniging, *Leendertz* 3747 (T.M.); Pretoria district: Hebron, *Dehuke* (T.M.); foot of south slope, Meintjies Kop, *Smith* 2312 (P.); Barberton district: Komatipoort, *Moss and Rogers* 618 (K., P.); Rustenburg district: Rustenburg, *Nation* 164 (K.) and *Nation* 246 (K.); Pietersburg district: in plantibus graminosis prope pagum Pietersburg, *Bolus* 11073 (B.H.); Mosdene, Naboomspruit, *Galpin* M 83 (P.); Klippan, Bushveld, *Rehmann* 5191 (K., B.M.); Zoutpansberg district: Valdezia, *Overmeyer* 1155 (T.M.).

PORTUGUESE EAST AFRICA.—Lourenco Marques, *Moss and Rogers* 742 (K., Z., W.).

46. **T. retusa** Burt Davy Fl. Tvaal. 1.2. pp. XXI, 378 (1932).

Type specimen, *Bolus* 7724, in Herbarium, Kew.

Stems flexuous, procumbent, erect or ascending, branching from the base and above, glabrous or slightly pubescent, dark brown. *Leaves* subsessile or very shortly petiolate, 3.5–7 cm. long, 3–7-jugate; leaflets 0.8–2 cm. long, 3.5–7 mm. broad, oblong-oblancheolate, apices very much retuse, mucronulate, glabrous above, glabrescent or very sparsely pubescent below. *Stipules* subulate, 4–6 mm. long. *Peduncles* terminal or leaf-opposed, laxly flowered, 3.5–15 cm. long. *Flower* 1.7 cm. long, pedicels 3–5 mm. long; bracts lanceolate, narrow, about equalling the pedicels. *Calyx* thinly and shortly pubescent, tube 7 mm. in diam., 3 mm. long, lobes triangular-subulate, two upper lobes connate, very short, others 2–3 mm. long. *Vexillum* thinly pubescent on back, 1.7 cm. long, 1.8 cm. broad. *Ovary* thinly pubescent. *Style* bearded. *Legumes* linear, very thinly and shortly pubescent, light brownish-yellow, 4.5–5 cm. long, 4–5 mm. broad.

TRANSVAAL.—Middelburg district: Middelburg, *Rogers* 24827 (K., G., Z., P.); Barberton district: juxta Kaap River prope Barberton, *Bolus* 7724 (K., B.H.); Kopje, Kaap Valley, Barberton, *Galpin* 1180 (K., P., N., S.A.M., A.M.); Barberton, *Pott* 5326 (T.M.); Lydenburg district: Schagen, Nelspruit, *Liebenberg* 3317 (K., Pa., P.); Pietersburg district: in clivibus Mt. Elandspruitbergen, *Schlechter* 3837 (B.H.); Shiluwane, *Junod* 1125 (K., Z.).

SWAZILAND.—In graminosis in terra "Middel Veld" dicta pr. pagum Bremersdorp, *Bolus* 11821 (K., B., B.H.).

47. **T. capensis** (Jacq.) Pers. Syn. 2.330 (1807); DC. Prodr. 2.252 (1825); Spreng. Syst. Veg. 3.233 (1826); Linnaea 7.168 (1832); E.Mey. Comm. Pl. Afr. Aust. 1.1.110 (1836); Ecklon and Zeyher Enum. Pl. Afr. Aust. Pt. 2 (1836); Hook. Lond. Journ. Bot. 2.88 (1843); Cape Plants, Krauss and Engler (1846); Harvey in Harv. and Sond.

Fl. Cap. 2.207 (1861-62); Bolus and Wolley Dod in Trans. S.A. Phil. Soc. 14.3.237 (1903); Zahlbr. Ann. K. K. Naturhist. Hofmus. 20.3.24 (1905); Wood Fl. Natal 42 (1907); Wood in Trans. S.A. Phil. Soc. 18.2.147 (1908); Burt Davy and Pott in Ann. Tvl. Mus. 3.3.146 (1912); Die Veg. der Erde 9.3.590 (1915); Phillips in Ann. S.A. Mus. 16.1.82 (1917); Bot. Survey S.A. Mem. 1.64 (1919); Bews Fl. Natal and Zululand 110 (1921); Bot. Survey S.A. Mem. 12.68 (1928); Bot. Survey S.A. Mem. 13.35.38 (1929); Levyns Guide to Flora of Cape Peninsula (1929); Burt Davy Fl. Tvaal. 1.2.378 (1912); Watt and Breyer-Brandwyk Med. and Pois. Pl. S.A. 74 (1932); Bothalia 3.2.239 (1937).

Syn. *Tephrosia capensis* (Jacq.) Pers. var. a. *Jacquini* Harv. in Fl. Cap. 2.207 (1861-62); E. Mey. Comm. Pl. Afr. Aust. 1.1.110 (1836); *Tephrosia capensis* (Thbg.) Pers. in O. Kuntze Rev. Gen. Pl. 1.174 (1891); *Tephrosia ternatifolia* R. G. N. Young, in Ann. Tvl. Mus. 14.4.406 (1932); *Galega capensis* Jacq. Coll. 2.292 (1788); Jacq. lc. Pl. Rar. 3.14 t. 574 (1786-93); Linn. Syst. Nat. ed. 13 per Gmelin 2.11.1130 (1792); Thunb. Prodr. 134 (1800); Willd. Sp. Pl. 3.11.1250 (1803); Linn. Syst. Nat. 6.1216 (London 1806); *Cracca capensis* (Thbg.) O. Ktze. Rev. Gen. Pl. 3.2.57 (1893).

Suffruticose. Stems procumbent, several from a woody root-stock, pubescence variable, branches slender. Leaves long petiolate, 2-4-jugate, 1-3 cm. long; leaflets sub-cuneate oblong or lanceolate, obtuse or acute, glabrescent above, glabrous or hirsute below, veining usually dark reddish-brown on lower surface, 1-3 cm. long, 0.5-1.4 cm. broad. Stipules subulate, 3-5 mm. long. Peduncles opposite leaves, slender, 7-15 cm. long, interruptedly few-flowered. Flower 0.65-1 cm. long; pedicels 3-5 mm. long. Calyx-teeth equalling or longer than the tube. Ovary 4-5 mm. long, silky. Style glabrous, Legume linear, narrow, 3.5 cm. long, 0.3 cm. broad, pubescent, thinly puberulous or glabrescent, about 8-seeded.

CAPE.—Capetown district: Cape Town, *Prior* (K.); *Alexander* 109 (K.); *Rogers* 17800 (G.); Camps Bay, *Prior* (K.); *Young* (T.M.); Hillside above Bantry Bay, Sea Point, *Smith* 2938 (P.); W. slopes, Lions Head, *Levyns* (S.A.C.); steinige stellen am westlichen Abhang des Kasteel Berg, *Zeyher* 4824 (B.H.S.); Kasteels Poort, Table Mtn., *Thorne* (S.A.M.); in fruticetis inter lapides alt. 2 mont. tab., *Ecklon* 817 (K.); Contour Path, N. slopes of Table Mtn., *Moss* 7803 (W.); Devils Peak, *Wolley Dod* 16 (B.H.) and 585 (K.); in Monte Diaboli, *Rehmann* 1096 (B.M., Z.); and 1097 (Z.); W. slopes of Apostles, *Pillans* 3472 (P.); in ericetis, Rondesbosch, *Zeyher* (S.A.M.); Kirstenbosch, *Adamson* (S.A.M.); Wynberg Hill, *Guthrie* 256 (S.A.C.); slopes behind Wynberg Park, *Kensit* (B.H., T.M.); Wynberg Hill, *Bolus* 3895 (B.H., A.M.); Simonstown, *Salter* (B.M.); Simons Bay, *Wright* (Pa.); Caledon district: *Hermanus*, *Rogers* 2644 (T.M.); *Galpin* 12902 (P.); *Gillet* 644 (B.H.); Swellendam district: on plains of George and Swellendam, *Bowie* 4 (B.M.); Riversdale district: Riversdale, *Schlechter* 1863 (I) (W.); *Levyns* 3155 (S.A.C.); *Rust* 217 and 305 (B.); Mossel Bay district: Mossel Bay, *Moran* (Kim., T.M.); George district: George, *Moss* 6099 (W.); Knysna district: Knysna, *Keet* 678 (P.); *Rosenbrock* 1159 (B.); Humansdorp district: The Glen, Humansdorp, *Burt Davy* (P.); Kouja R., near drift on road from Zuur Anys, *Fourcade* 3092 (K.); Uitenhage district: on fields by Zwartkop R. and on hills of Adow, *Zeyher* 59 (K., B.H., A.M.); Uitenhage, *Penther* 2462 (V., B.); *Zeyher* 282 (Pa., G., B.); *Prior* (K.); *Thode* A 641 (P.); Zuurberg Sanatorium, *Long* 262 (K., P.) Enon near Zuurberg, *Thode* A 2638 (P., N.); Aloes, *Drege* 3068 (P., A.M.); Port Elizabeth district: near Port Elizabeth, *Baur* (K.); Emerald Hill, *Paterson* 2342 (P., B.H., A.M.) Somerset East district: common along Sky Parlour Level, *Scott Elliot* 498 (B.); Graaff Reinet district: summit of Cave Mtn. near Graaff Reinet, *Bolus* 247 (K., B.H.); Queenstown district: Fincham's Nek. Queenstown, *Young* (W.); Plains, Queenstown, *Galpin* 1679 (B., P.); Cathcart district: Cathcart, *Kuntze* (K.); Albany district: Fish River Heights, *Hutton* (P.); Bathurst district: road to Three Sisters, *Britten* 718 (A.M.); East London district: East London, *Ottley* 2523 (W.); Nahoon R. Valley, *Smith* 3763 (P.); Buffalo River, *Rogers* (T.M.); Komgha district: grassy hills, Komgha, *Flanagan* 132 (A.M., P., S.A.M.); British Kaffraria, *Cooper* 540 (B.M., Z., V.); Franklin district: near Newmarket, *Krook* (B.).

NATAL.—Port Natal, *Gueinzus* 332 (V.); *Gueinzus* 625 (V.); *Gueinzus* 312 (Pa., V.); Mayville, Wood (N.); Inanda district: Umhlanga, Wood 572 (B.M.); Umhlanga, Wood 1000 (N.); Pinetown district: New Germany, *Indian Collector* (N.); Dundee district: The Dam, Talana, Dundee, *Truscott* 58 (P.); Vryheid district: Vryheid, *Pole-Evans* 3896 (P.); Weenen district: among rocks, South Downs, Weenen Cty, *Evans* 478 (N.); New-castle district: Boscobello, *Jenkins* (T.M.); no definite locality, Wood 779 (K., B.H.). Zululand, *Gerrard* and *McKen* (B.M., Pa.).

BASUTOLAND.—Plateau slopes, Leribe, *Dieterlen* 333 (P., N., S.A.M., Pa.); on slopes of mtn., S. Basutoland, *Castignani* (G.U.C.).

ORANGE FREE STATE.—Harrismith district: Harrismith, *Sankey* 55 (K.); Bethlehem district: Fouriesburg, *Potts* 4911 (K., G.U.C.); Heilbron district: Leeuw Spruit and Vredefort, *Barrett-Hamilton* (B.M.); Bloemfontein district: E. side of Grants Hill, Bloemfontein, *Potts* (K., P., G.U.C.); Top of Grants Hill, Bloemfontein, *Potts* 2364 (P.).

TRANSVAAL.—Standerton district: Standerton, *Leendertz* 4113a (T.M.); Heidelberg district: Bolton Wold, Vereeniging, *Burt Davy* 15083 (P.); grass veld, Doornvlei Kloof, *Moss* 14249 (W.); Benoni *Bradfield*. 127 (P.); Middelburg district: Pan, Middelburg, *Burt Davy* 13236 and 13237 (P.); Pretoria district: in graminosis pr. Aapies River, *Schlechter* 3665 (B., T.M., B.H.); Skinners Court, Pretoria, *Burt Davy* (P.); Meintjies Kop, Pretoria, *Smith* 1417 (Z., P.); Wonderboompoort, *Rehmann* 4593 (B.M., Z.); Barberton district: Komatipoort, *Moss* and *Rogers* 619 (Z.); Marico district: Sandy Hill, Marico, *Oberholzer* s. 32 (B.); Waterberg district: Potgietersrust, *Crawley* (P., T.M.); road between Pietersburg and Louis Trichardt, *Pole-Evans* and *Van Nouhuys* 1941 (P.); Zoutpansberg, *Junod* 4372 (P., T.M.); on lower slopes of Zoutpansberg, *Schweickerdt* and *Verdoorn* 531 (P.). No definite locality, Vaal River, *Zeyher* (B., S.A.M.); Bushveld inter Elands R. and Klippan, *Rehmann* 5046 (Z.); *Ecklon* and *Zeyher* 2398 (V.).

SOUTH AFRICA.—No definite locality: *Burchell* 92 (G.); *Burchell* 6146 (Pa.); *Krauss* (V.); *Krebs* (G., B.); *Bayer* (B.); *Rehmann* 1098 (Z.); *Harvey* 733 (K.); *Engler* 47 (B.); *Bergius* (B.); *Lehmann* (Pa.); *Lichtenstein* 50 (B.); *Moricand* (G.); *Mund* and *Maire* (V., B.); *Mund* (K.); *Ecklon* and *Zeyher* 1629 (V.); *Vaillaur* (Pa.).

Var. *a hirsuta* Harv. Leaflets more or less densely pubescent or hirsute below; oblong, obtuse or acute.

CAPE.—Riversdale district: Zandhoogte, *Muir* 86 (P.); in graminosis pr. Riversdale, *Schlechter* 1863 (B.M., G., Pa., Z., B., P., A.M.); George district: pone Georgetown, *Zeyher* (S.A.M.); George, *Moss* 6095 (W.); *Rogers* 26469 (K.); *Wilman* 823 (S.A.M.); in montibus Long Kloof, Montagu Pass, *Fr. de Castelnau* 97 (Pa.); Outeniqua Mtns., Montagu Pass, *Rehmann* 12 and 13 (Z.); Knysna district: Poort Hills, *Fourcade* 589 (Z., A.M.); Knysna, *Schonland* 3474 (A.M., Pa.); *Breyer* (T.M.); Karatora Village, *Keet* 1149 (A.M.); Voetzie, Knysna, *Keet* 678 (A.M.); on hillsides, E. Head, Knysna, *Williamson* 106 (A.M.); Hackerville—Knysna, *Breyer* (T.M.); Plettenberg Bay, *Zeyher* (S.A.M.); *Rogers* 27942 and 28391 (P.); *Rogers* 28392 (K.); Uniondale district: on edge of road, De Vlucht, *Keet* 593 (A.M.); along the Avontuur Line, *Britten* 1035 (P.); Humansdorp district: mixed Duine veld at Slang River, Humansdorp, *Phillips* 3418 (K., P.); Uitenhage district: Aloes, *Drege* 3157 (P.); Uitenhage, *Thode* A 641 (N., P.); near road from Uitenhage to Van Stadens, *Schonland* 3271 (P., A.M.); in lapidosis ad van Stadens Mtns., *Zeyher* 2396 (S.A.M.); Van Stadens, *Paterson* (T.M.); grassy hills, van Stadens R. near Mine Road, *Bolus* (B.H.); Port Elizabeth district: bushyige Felder, Port Elizabeth, *Rosenbrock* 87 (B.); Humewood, *Holland* 3724 (B.H.); Mill Park, Port Elizabeth, *Moorshead* (W.); *Moss* 15417 (W.); Alexandria district: Zuurborg, *Paterson* 33 (A.M.); Sandflats, Hillary, *Burt Davy* (P.); Grahamstown district: Grahamstown, *Daly* and *Cherry* 925 (T.M.); *Burt Davy* 11543 (P.); *Burt Davy* 12166 (P.); *Rogers* 27329 (K., Z., P.); near Grahamstown, *Gillett* 2494 (B.H.); *Zeyher* (S.A.M.); dry slopes, Gowies Kloof, Oatlands, *Rennie* 186 (S.A.C.); flats, *Hofman's Bosch*, *Britten* 1035 (A.M.); in lapidosis clivis, Bothas Hill, *MacOwan* 478 (K.);

Bothas Hill, *Dyer* 1426 (B., P., A.M.); Peddie Road, *Dyer* 1360 (A.M.); Albany, *Parry* (A.M.); *Britten* 718 (P.); *Gawl* (P.); Bathurst district: Port Alfred, *Potts* 221 (A.M.); Kingwilliamstown district: Kingwilliamstown, *Hilner* 110 (A.M.); Stockenström district: grassy ridges, Willsdale Commonage, Stockenström, *Scully* 228 (S.A.M.); Queenstown district: grassy plains, Queenstown, *Galpin* 1679 (A.M.); Aliwal North district: on rocky mountain sides, Elands Hoek, near Aliwal North, *Bolus* 293 (B.H.); East London district: grass plains, Shelley Beach, *Galpin* 7344 (A.M., P.); Cambridge, *Wormald* 9 (A.M.); Coldstream, *Schonland* 1521 (A.M.); Komgha district: grassy hills near Komgha, *Flanagan* 617 (P., A.M., S.A.M.); Willowvale district: River mouth, Mazeppa Point, *Hilner* 462 (P., A.M.); Umtata district: near Umtata, *Flanagan* 2854 (B.H.); Cafferland, *Gill* (K., Z.); East Griqualand: in clivis saxosis Kokstad, *Tyson* 2976 (S.A.M.); in graminosis clivis "Clydesdale" ad flumen Umzimkulu, *Tyson* 1432=2783 (Pa., V., Z., P., S.A.M., T.M.). No definite locality, "Mofube, Cape", *Jacottet* (Z.).

BASUTOLAND.—Leribe, *Phillips* 522 (S.A.M.).

NATAL.—Heavetree Farm, *Ralfe* (P.).

ORANGE FREE STATE.—Bethlehem district: Witzies Hoek, *code* (B.H.); Bloemfontein district: in collibus lapidosis prope Bloemfontein, *Bolus* 10802 (B.H.); Winburg district: Houtenbek near Brandfort, *Burt Davy* 14700 and 14694 (P.); Kroonstad district: Kroonstad, *Pont* 443 (P.).

TRANSVAAL.—Potchefstroom district: on veld preservation experiment plots, Potchefstroom, *Liebenberg* 915 (P.); Johannesburg district: Thorntree Kloof, *Moss* 6803 and 10533 (W.); Modderfontein, *Conrath* 231 A (Z., B.); Pretoria district: Pretoria, *Leendertz* 466 (B.H.); colles supra Aapias River, *Rehmann* 4399 (Z.); Barberton district: Komati-poort, *Rogers* 2266 (Z.); in graminosis pr. Crocodile River, *Schlechter* 3987 (B., B.H.); Lydenburg district: bei der Stadt, Lydenburg, *Wilms* 365 (K., B.M., P., G., Z., B.).

Var. *β. angustifolia* Harv. Leaflets very narrow, lanceolate, complicate, mucro recurved, slightly hirsute below.

CAPE.—Swellendam district: in collibus graminosis ad Buffelsjagts River, Swellendam, *Zeyher* (S.A.M.); Mossel Bay district: Vrigers Berg, *Muir* 2046 (P.); Uniondale district: rocky hill N. of Joubertina, *Fourcade* 2935 (K.); Humansdorp district: Loerie Plantation, Humansdorp, *Dix* 119 (B.H.); Uitenhage district: in montibus ad Elandsriver, Uitenhage, *Zeyher* (S.A.M.); *Bolus* (B.H.); *Burchell* (K.); ad flumen Zwartkopsrivier, *Zeyher* (S.A.M.); in arenosis ad Zwartkopsrivier, *Zeyher* 2397 (S.A.M.) Albany district: Redhouse, *Paterson* 296 (A.M.); Grahamstown, *Rogers* 27426 (A.M.), and *Rogers* 27326 (K., P.); Penrich Farm, Botha's Ridge, *Dyer* 1165 (A.M., P.); Assegai Bosch, *Breyer* (T.M.); Graaff Reinet district: Cave Mt. near Graaff Reinet, *Bolus* 11822 (B.H.); Cradock district: in lapidosis aridis prope Mortimer in Ditone Cradock, *Kensit* (B.H.); Cathcart district: *Drège* (K.); Pondo-land: Port St. Johns, *Flanagan* (P.).

NATAL.—No definite locality, *Cooper* 2221 and 2222 (K.).

Var. *γ. longipetiolata* H. M. Forbes var. nov.

A typo petiolis longioribus differt.

Leaves 1-3-jugate, 3-10 cm. long, petiole before first pair of leaflets 2.5-9 cm. long; leaflets 1.9-3.5 cm. long, 4-7 cm. broad.

CAPE.—Grahamstown district: Trapps Valley, *Anstey* 4 (A.M.); Bothas Hill, *MacOwan* (B.H.); East London district: East London, *Breyer* (T.M.); Kentani district: prostrate among grasses, Coast, *Pegler* 1295 (T.M., P.).

T. ternatifolia R. G. N. Young in Ann. Tvl. Mus. 14.4.406 (1932). I have examined all the material of this species cited by Young and can find no legitimate reason for separating it from *T. capensis*. The distinguishing character used by Young in his key is "terminal leaflets equalling the petiole," but this feature is not constant, as in speci-

mens written up and cited by Young, the terminal leaflets not only equalled the petioles, but exceeded them or were much shorter. These differences in length quite frequently occurred on the same specimen. The interrupted inflorescence and dark venation on the lower sides of the leaflets are both characteristic of *T. capensis*, therefore, in my opinion, the specimens cited by Young as *T. ternatifolia* should be transferred back to *T. capensis*.

The very large amount of material included in this species shows a great range of variety in general habit, and, in particular, in the length and breadth of the leaflets, and in the almost complete absence of pubescence to types which are distinctly hairy. These variations frequently so merge into each other that it is puzzling to decide definitely to which variety a specimen may belong, so that the varieties tend to become rather artificial. In a few instances, specimens, generally collected only once, do appear to differ, but until such time as more complete material has been collected from the same localities, it is, I think, advisable to retain them in this group.

To the Zulus this plant is "isiKhwali" and they use the root to make an emetic for biliousness. The Suto name is "pelo-di-maroba" and the Suto use the cooked root with a decoction of *Commelina africana* for nervousness and weak heart.

48. *T. pseudocapitata* H. M. Forbes sp. nov., affinis *T. macropodae* Harv., sed caulibus brevioribus, stipulis subulatis, dentibus calycis tubo brevioribus differt.

Caules ascendentes vel decumbentes, e basi ramosi, parce fulvo-pilosi. *Folia* 2-4-jugata, 2.5-8 cm. longa; foliola obovato-cuneata, 2.5-5.5 cm. longa, 0.8-2 cm. lata, mucronata, supra glabra, subtus leviter pilosa; stipulae subulatae, usque ad 1.5 cm. longae; pedunculi usque ad 14 cm. longi. *Flores* 1.5 cm. longi; bractae lineari-subulatae; dentes calycis triangulari-subulati, tubo breviores; ovarium pubescens; stylus pilosus.

Type specimen, Wylie (N.H. 21787), in Natal Herbarium, Durban.

Stems ascending or decumbent, branching from the base, thinly tawny pilose. *Leaves* 2-4-jugate, 2.5-8 cm. long; leaflets obovate-cuneate, mucronate, glabrous above, thinly pilose below, 2.5-5.5 cm. long, 0.8-2 cm. broad. *Stipules* subulate, up to 1.5 cm. long. *Peduncles* terminal, up to 14 cm. long, flowers few in a short dense raceme, almost capitate. *Flowers* purple, 1.5 cm. long; bracts linear-subulate. *Calyx*-lobes triangular-subulate, shorter than the tube. *Ovary* pubescent. *Style* bearded.

NATAL.—Krantzkop district: Greytown, Wylie [N.H. 21787] (N.); Wylie [N.H. 2799] (N., P.).

49. *T. natalensis* H. M. Forbes sp. nov., affinis *T. pseudocapitatae* H. M. Forbes, sed inflorescentiis laxe racemosis, dentibus calycis tubo longioribus differt.

Caules ascendentes vel decumbentes, e basi ramosi, fulvo-pilosi. *Folia* 3-5-jugata, 6.5-12 cm. longa; foliola cuneata vel obovato-cuneata, 2-4.5 cm. longa, 0.7-2 cm. lata, apice truncata vel emarginata, supra glabra, subtus leviter pilosa; stipulae subulatae, acuminatae, 1-2 cm. longae, 3-5 nervatae; pedunculi 6.5-19.5 cm. longi. *Flores* 1.3-2 cm. longi; bractae lineari-subulatae, 7-8 mm. longae; calyx dense fulvo-pilosus, dentibus lineari-lanceolatis tubo excedentibus; ovarium fulvo-pubescens; stylus pilosus.

Type specimen, Wood 8341, in Natal Herbarium, Durban.

Stems ascending or procumbent, branching from the base, fulvous pilose. *Leaves* 3-5-jugate, 6.5-12 cm. long; leaflets cuneate or obovate-cuneate, truncate or emarginate, mucronulate, glabrous above, thinly pilose below, 2-4.5 cm. long, 0.7-2.2 cm. broad. *Stipules* subulate, acuminate, 1-2 cm. long, 3-5 nerved. *Peduncles* terminal, 6.5-19.5 cm.

long, flowers in a lax raceme, in fascicles of 2-4. *Flowers* 1.35-1.9 cm. long; pedicels 0.6-1 cm. long; bracts linear-subulate, 7-8 mm. long. *Calyx* densely fulvo-pilose, teeth longer than the tube, linear-lanceolate. *Ovary* fulvo-pubescent. *Style* bearded.

NATAL.—Maritzburg district: Hawthorns Hill, Maritzburg, *Allsopp* 465 (N.); near Maritzburg, *Bell* (N.); Howick, *Wood* 8431 (K., N.); Harding district: Harding, *Oliver* 98 (N.).

50. *T. apiculata* H. M. Forbes sp. nov., affinis *T. natalensi* H. M. Forbes, sed foliolis distincte apiculatis, dentibus calycis tubo subaequilongis differt.

Caules decumbentes vel ascendentes, e basi ramosi, parce pubescentes. *Folia* 2-5-jugata, 1.5-4.5 cm. longa; foliola elliptico-cuneata, apiculata, 2-4 cm. longa, 0.5-1.2 cm. lata, supra glabra, subtus leviter pilosa; stipulae lineari-subulatae, acuminatae, 1-1.5 cm. longae; pedunculi terminales axillaresque, usque ad 16 cm. longi; bractae lineares, 7-8 mm. longae. *Flores* 1.3-1.5 cm. longi; calyx dense pubescens, lobi tubo subaequilongi uno longiore; ovarium dense pubescens; stylus pilosus. *Fructus* non visus.

Type specimen, *Acocks* 11749, in Natal Herbarium, Durban.

Stems decumbent or ascending, several arising from a woody root-stock, thinly pubescent. *Leaves* 2-5-jugate, 1.5-4.5 cm. long, shortly petioled; leaflets elliptic-oblong, apiculate, thinly pilose below, glabrous above, 2-4 cm. long, 0.5-1.2 cm. broad. *Stipules* linear-subulate, acuminate, 1-1.5 cm. long. *Peduncles* terminal and axillary, up to 16 cm. long, few-flowered at apex or flowers in an interrupted raceme, 2-4 together; bracts linear, 7-8 mm. long. *Flowers* 1.3-1.5 cm. long; vexillum densely tawny-velvety without. *Calyx* densely pubescent, four lobes subequal to tube in length, lowest longer, lobes lanceolate. Vexillary stamen free; ovary densely pubescent. *Style* bearded. *Legumes* not seen.

NATAL.—Utrecht district: Kaffir Drift, *Thode* A 224 and A 268 (N., P.); Paulpietersburg district: between Paulpietersburg and Sunkelsdrift, *Acocks* 11749 (N.); Paulpietersburg, *Galpin* 9707 and 10908 (K., P.).

TRANSVAAL.—Piet Retief district: Piet Retief, *Jenkins* (T.M.); Ermelo district: Spitzkop, Ermelo, *Pott* (T.M., B.H.).

KEY TO SECTION 4.

- | | |
|--|-----------------------------|
| Stems erect..... | A. |
| Stems ascending, decumbent or trailing..... | B. |
| A. Peduncles terminal..... | C. |
| Peduncles terminal, axillary or leaf-opposed..... | D. |
| C. Peduncles 2-7 cm. long, densely flowered..... | 51. <i>zombensis</i> . |
| Peduncles up to 5 cm. long, few (2-4) flowered..... | 52. <i>Bachmannii</i> . |
| D. Peduncles terminal and leaf-opposed..... | E. |
| Peduncles terminal and axillary..... | F. |
| E. Peduncles racemosely few-flowered towards apex..... | 53. <i>Wylicii</i> . |
| Peduncles not racemosely flowered..... | G. |
| G. Flowers fasciculato-corymbosely at apex..... | 54. <i>grandiflora</i> . |
| Flowers 2-3 together in interrupted spicate glomerules..... | 55. <i>glomeruliflora</i> . |
| F. Peduncles up to 2 cm. long; calyx lobes much longer than tube.. | 56. <i>subulata</i> . |
| Peduncles exceeding 2 cm.; calyx lobes subequal to tube..... | 57. <i>shiluwaniensis</i> . |
| B. Stems ascending or decumbent..... | H. |
| Stems trailing or diffuse..... | I. |
| H. Stems, etc., densely albo-pilose..... | 58. <i>albissima</i> . |
| Stems, etc., not albo-pilose..... | J. |
| J. Stipules cordate; leaves 5-6-jugate..... | 59. <i>cordatu</i> . |
| Stipules ovate; leaves 1-4-jugate..... | K. |
| K. Stems erect or ascending; calyx teeth longer than tube..... | 60. <i>spathacea</i> . |
| Stems decumbent or ascending; calyx teeth subequal to tube L. | |

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| L. Stems bearing several leaves and peduncles ; leaves long petioled | 61. <i>Galpinii</i> . |
| Stems bearing one leaf and 1-2 peduncles ; leaf shortly petioled.. | 62. <i>unifolia</i> . |
| I. Flowers subtended by minute lanceolate bracts ; leaves 5-7-jugate | 63. <i>radicans</i> . |
| Flowers subtended by ovate bracts ; leaves not more than 4-jugate..... | M. |
| M. Leaves shortly petioled..... | 64. <i>zuluensis</i> . |
| Leaves long petioled..... | N. |
| N. Stems more or less robust ; stipules broadly ovate, up to 1.2 cm. long..... | 65. <i>macropoda</i> . |
| Stems subfiliform ; stipules ovate, up to 6 mm. long..... | O. |
| O. Leaves 1-2-jugate ; stamens monadelphous..... | 66. <i>aemula</i> . |
| Leaves 3-4-jugate ; stamens diadelphous..... | 67. <i>diffusa</i> . |

51. **T. zombensis** Baker in Kew Bull. 257 (1897) ; Baker f. Leg. Trop. Afr. 1.213 (1926) ; Burt Davy Fl. Tvaal. 1.2.377 (1932).

Type specimen, *Whyte*, in Herbarium, Kew.

A shrub, branches woody, densely clothed with white or tawny hairs. *Leaves* shortly petiolate, 5-15-jugate, 3.5-18.5 cm. long ; leaflets oblong, obtuse, mucronate, green and glabrous above, sericeous below, 1.5-4.5 cm. long, 0.6-1.5 cm. broad. *Stipules* ovate, acuminate, densely pilose on back, 2-3 mm. broad, 0.5-1 cm. long. *Peduncles* terminal, 2-7 cm. long, racemes densely flowered, subglobose. *Flowers* up to 1.8 cm. long, pedicellate ; pedicels 6-7 mm. long ; bracts lanceolate, pubescent. *Calyx* densely pilose, tube 4 mm. long, 1 cm. in diam., lobes acuminate, 0.7-1 cm. long, much longer than the tube. *Vexillum* orbicular, sericeous on the back, 1.4 cm. long, 1.5 cm. broad. *Ovary* linear, pilose, 9 mm. long. *Style* thinly bearded along inner surface. *Legumes* about 3 cm. long, 6 mm. broad, densely velvety.

CAPE.—Piquetberg district : open mountain side, De Hoek, *Taylor* 646 (P.).

TRANSVAAL.—Pietersburg district : Magoebas Kloof, Houtboschberg, *Burt Davy* 2600 (P.) ; upper slopes of Magoebas Kloof, *Obermeyer* (T.M., N.) ; New Agatha, *Rogers* 18886 (K., Z., B.H., T.M.) ; De Hoek, *Taylor* 646 (P.).

The type specimen was collected by *Whyte* at Mt. Zomba, Nyasaland in 1896. It has also been collected in Nyasaland by Buchanan and in Southern Rhodesia by Eyles.

In general appearance *T. zombensis* Bak. is similar to *T. Vogelii* Hk. f., but there are points of difference, particularly in the long acuminate calyx lobes of the former species. *T. zombensis* is reputed to have toxic properties similar to those of *T. Vogelii*.

52. **T. Bachmannii** Harms in Engl. Bot. Jahrb. 26.286 (1899).

Type specimen, *Bachmann* 616, in Botanisches Museum, Berlin-Dahlem.

A shrub, branching freely, branches ascending, appressedly puberulous when young, becoming quite glabrous. *Leaves* 3-6-jugate, shortly petiolate, 1-4 cm. long ; leaflets linear-oblongate, narrowed towards the base, apex obtuse or acute, mucronulate, glabrous above, pubescent below, 1.8-4.5 cm. long, 2.5-5.5 mm. broad. *Stipules* ovate, acute, pubescent or subglabrous, 5-nerved, 4-6 mm. long, 2-3 mm. broad. *Peduncles* up to 5 cm. long, terminal, few-flowered (2-4 flowers) ; bracts ovate, sericeous, up to 5 mm. long. *Flowers* about 2 cm. long ; pedicels 4-7 mm. long, sericeous. *Calyx* densely fulvous silky, lobes not longer than the tube, upper lobe lanceolate-ovate, acute ; lateral lobes a little shorter, deltoid-ovate, acute, lower broadly 2-dentate. *Vexillum* about 2 cm. long and broad, densely fulvous silky without. *Ovary* with long fulvous hairs along the sutures. *Style* bearded. *Legumes* 2-7 cm. long, 0.8 cm. broad, fulvous along the margins.

CAPE.—Pondoland : no definite locality, *Bachmann* 616 (B.).

NATAL.—Port Shepstone district: near Murchison, *Wood* 3021 (N.); *Wood* 3101 (K., N.); Margate, *Rump* (N.); Oribi Flats, *Rump* (N.).

A shrub with large showy mauvy-pink flowers. It is readily distinguished from the other large flowered species by the tawny hairs on the petioles, peduncles, calyx and vexillum which are a striking contrast to the canescent pubescence of the bracts subtending the flowers and the undersurface of the leaves.

53. **T. Wyliei** H. M. Forbes sp. nov., affinis *T. grandiflorae* (Ait.) Pers., sed foliolis floribus bracteisque multo minoribus differt.

Suffrutex. *Caules* erecti, glabrescentes vel parce pubescentes. *Folia* 4-7-jugata, 4-7.5 cm. longa; foliola cuneata, apice retusa vel emarginata, 1-2.2 cm. longa, 0.5-1 cm. lata, mucronata, supra glabra, subtus parce appresse pubescentia; stipulae ovato-cordatae, acuminatae, 5-6 mm. longae; pedunculi usque ad 22 cm. longi; bractae ovatae, 3-5 mm. longae, mox caducae. *Flores* 1.3-1.5 cm. longi; calyx leviter pubescens, dentibus lanceolatis tubo subaequilongis; stylus pilosus. *Fructus* linearis, 3.5-4 cm. longis, 0.7 cm. latus, glaber.

Type specimen, *Wylie* (Wood 5219), in Natal Herbarium, Durban.

Suffrutex. *Stems* erect, branching, glabrescent, or very slightly pubescent, dark reddish-brown. *Leaves* 4-7-jugate, 4-7.5 cm. long; petiole 1.5-3.5 cm. long before first pair of leaflets; leaflets cuneate, apex retuse or emarginate, mucronate, glabrous above, shortly appressedly pubescent below, 1-2.2 cm. long, 0.5-1 cm. broad. *Stipules* ovate-cordate, acuminate, 5-6 mm. long. *Peduncles* terminal and leaf-opposed, 6-22 cm. long, few-flowered towards apex. *Flowers* purple, 1.3-1.5 cm. long. *Bracts* ovate, 3-5 mm. long, soon caducous. *Calyx* sparsely pubescent, lobes lanceolate, subequal to tube. *Style* bearded. *Legumes* linear, 3.5-4 cm. long, 0.7 cm. broad, glabrous.

NATAL.—Elandskop district: Sevenfontein near Boston, *Wylie* [Wood 5219] (N.); *Wylie* [Wood 9928] (N., Z., P., B.H.); Maritzburg district: Zwartkop, *Wood* 10235 (N., P.); *Wood* 11142 (N.).

This plant has been named in honour of Mr. J. Wylie who, for many years, worked with the late Dr. Medley Wood. On his many trips throughout Natal and Zululand he collected extensively, many of his specimens being new to science.

54. **T. grandiflora** (Ait.) Pers. Syn. 2.329 (1807); DC. Prodr. 2.251 (1825); Spreng. Syst. Veg. 3.232 (1826); Ecklon and Zeyher Enum. Pl. Afr. Aust. Extratrop. 246 (1835); E. Mey. Comm. Drège Pl. Afr. Aust. 1.1.110 (1836); Cape Plants, Krauss and Engler, 54 (1846); Harvey in Harv. and Sond. Fl. Cap. 2.209 (1861-62); O. Kuntze Rev. Gen. Pl. 1.175 (1891); Bolus and Wolley Dod in Trans. S.A. Phil. Soc. 14.3.257 (1903); Zahlbr. Ann. K. K. Naturhist. Hofmus. 20.3 (1905); Wood Fl. of Natal 42 (1907); Wood in Trans. S.A. Phil. Soc. 18.2.147 (1908); Burt Davy and Pott in Ann. Tvl. Mus. 3.3.146 (1912); Die Veg. der Erde 9.3.590 (1915); Bot. Survey S.A. Mem. 1.64 (1919); Bews Fl. Natal and Zululand 111 (1921); Watt and Breyer-Brandwyk Med. and Pois. Pl. S.A. 74 (1932).

Syn. *Galega grandiflora* Ait. Hort. Kew 3.70 (1789); Vahl. Symb. 2.84 (1791); Thunb. Prodr. 134 (1800); Willd. Sp. Pl. 3. ii. 1244 (1803); Linn. Syst. Nat. 6.1215 (1806); Ait. Hort. Kew ed. 2.4.356 (1812); Thunb. Fl. Cap. ed. Schultes 601 (1823); Bot. Reg. 9 t. 769 (1824); Juel, in Plantae Thunberg 221 (1918); *Apodynomene grandiflora* E. Mey. Comm. Pl. Afr. Aust. 111 (1835-36); Hook. Lond. Journ. Bot. 2.88 (1843); Krauss Fl. des Cap und Natallandes 54 (1846); *Galega rosea* Lam. Encycl. 2. 599 (1786) sec. Persoon Syn. 2.329 (1807).

Type specimen, Aiton Cult. Hort. Kew is non extant. Aiton (1789) cites *Galega grandiflora* as being figured in L'Heritier Stirp. nov. t. 44, but according to Britten and Woodward Journ. Bot. 43.270 (1905), this plate was never published. Aiton (1812) withdraws this reference in the second edition of his "Hortus Kewensis."

Fruticose, erect. *Stems* subglabrous to densely pubescent. *Leaves* up to 7.5 cm. long, shortly petiolate, 4-8-jugate; leaflets variable in length and breadth, cuneate-oblong, obcordate or sometimes almost lanceolate, obtuse or acute, retuse or mucronulate, glabrous or pubescent above, canescent below, 1-3.8 cm. long, 0.4-1.8 cm. broad. *Stipules* broadly ovate, 0.5-1.3 cm. long. *Peduncles* terminal and opposite leaves, 3-12 cm. long, fasciculato-corymbose at apex; young flowers enclosed by broad ovate deciduous bracts up to 1.8 cm. long and 1 cm. broad at base. *Flowers* up to 2 cm. long, pedicellate; pedicels 0.5-1.3 cm. long. *Vexillum* densely fulvescent without. *Calyx* thinly to densely pubescent, tube up to 3 mm. long, lobes subulate, unequal, two upper slightly shorter than tube, lateral and lowest 2.5-3.5 mm. long, lowest longest. *Ovary* 1.4-1.6 cm. long, hairy along sutures. *Style* bearded. *Legumes* 4-7.5 cm. long, 0.9-1 cm. broad, linear, compressed, glabrous, thinly hairy along sutures.

CAPE.—Humansdorp district: Clarkson, *Penther* 2473 (V., B.); *Thode* A 812 (K., N., P.); Kabeljous river, *Penther* 2469 (B.); Humansdorp, *Rosenbrock* 456 (B.); *West* 92 (K.); about 7 m. N. of Humansdorp, *Schonland* 3044 (A.M.); between Gamtoos River and Humansdorp, *West* 207 (B.H.); Uitenhage district: Diep Valley, *Zitzikamma*, *Fourcade* 780 (A.M.); *Zitzikamma*, *Krauss* 29 (V.); ad sylv. marginis in *Zitzikamma*, *Murray* 39 (Z., B.); among shrubs in district of Uitenhage, *Ecklon* and *Zeyher* (B.); Hofman's Bosch near St. Albans, *Britten* 1053 (A.M., Pa.); on banks of the Krom River, *Bowie* 1 (K., B.M.); Krom River, *Zeyher* (A.M.); *Thunberg* (U., B.M.); *Pappe* (K.); Albany district: in humidis vallibus pr. Grahamstown, *Read* (K.); hill above Grahamstown, *Prior* (K.); Featherstown Kloof, *Rennie* 179 (S.A.C.); Grahamstown, *Rogers* 1579 (K.); *Rogers* 336 (B.M.); *Schonland* (Z., B.); *Schlechter* 2617 (B., A.M.); *Williamson* 20 (B.M.); *Daly* and *Sole* 131 a (P.); and *Daly* and *Sole* 1013 (A.M.); *Gower* 4 (P.); *Alexander* 112 (K.); *Bolus* (T.M.); *Haagner* 235 (Z., B.); ad ripas fluviorum pr. Grahamstown, *MacOwan* 1929 (A.M.); *MacOwan* 206 (B.M., Z., N.); edge of forest, Howison's Poort, *Zeyher* (S.A.M.); dry rocky hills at Grahamstown, *Bunbury* 41 (B.M.); Signal Hill, *Bolus* 1930 (B.H.); in collibus inter Grahamstown and Coldstream, *Bolus* 10634 (B.H.); inter Grahamstown and Assegai Bosch, *Zeyher* (K., S.A.M.); on stony hills between Grahamstown and Assegai Bosch, *Zeyher* 191 (V., O.); Flats, Oudebosch, *Fourcade* 866 (K., Z., A.M.); Trapps Valley, *Daly* 631 (A.M., P.); Garrow, *Burt Davy* 11597 (P.); Albany, *Harvey* 191 (K., B.M.); Victoria district, near Alice, *Cooper* 374 (K., B.M., Z., V., P.); Kingwilliamstown district: *Drège* (K.); Hoffmanskloof and Driefontein, *Drège* (S.A.M.); Stockenstroom district: Elands River above Waterfall, Stockenstroom, *Scully* 216 (P.); Stutterheim district: Amabele, *Moss* 20491 (W.); Fort Cunynghame, *Schonland* 80 (A.M.); pr. Fort Cunynghame, *Bolus* 21777 (B.H.); Bathurst district: Port Alfred, *Rogers* 28073 (Z.); East London district: East London, *Breyer* (T.M.); *Galpin* 3299 (A.M., P.); *Rogers* 17015 (Z., W.); *Thode* (S.); *Otley* 2529 (B.M., W.); Nahoon River Valley, *Smith* 3750 (K., P.); Blood River Valley, Southernwood, *Smith* 3666 (P.); Kei Road, *Schlechter* 6134 (B., A.M.); along road to Buffalo Bridge, *Colmer* (G.U.C.); Komgha district: among shrubs near Komgha, *Flanagan* 632 (Z., S.A.M., B.H., A.M.); Komgha, *Krook* [Penther 2540 and 2545] (V., B.); Kentani district: *Pegler* 458 (K., B.M., P., S.A.M., A.M.); Qutosa, Kentani, *Edwards* [Moss 17581] (W.); Kaffaria, *Cooper* 82 (K., B.M., Z., G., V., N., P., B.H.); Pondoland district: Port St. Johns, *Schonland* 4046 (A.M.); *Moss* 2723 (W.); *Bachmann* 618 (B.); Libode, *Schonland* 3895 (A.M.); apud litus ad ostia fl. Umkwani, *Tyson* 2624 (K., B.M., Z., S.A.M.); Pondoland, *Bachmann* 609 and 610 (B.); *Bachmann* 611 (B.M., B.); *Bachmann* 612 (Z., B.); an moorig Rand v. Sandsteinbach, *Beyrich* 252 (B.); inter Omsamwubo and Omsamecabo Rivers, *Drège* (K.); Umtata district: Colossa-Umtata, *Krook* [Penther 1612] (V., B.); East Griqualand, Mt. Ayliffe district: In montibus pr. Mt. Ayliffe, *Tyson* 2752 (P., S.A.M., S.).

NATAL.—Port Shepstone district: Margate, *Beardmore* [Moss 15139] (W.); near Murchison, *Wood* 3022 (K., N.); Marburg, *Rogers* 544 (B.M.); Ixopo district: open ground, Umgoye, near Dumisa, *Wood* 3865 (B.M., Z.); Umzinto district: Ifafa, *Rudatis* 42 (B.); Durban district: coastland, *Sutherland* (K.); Pinetown district: Northdene, wood near Krantzklouf, *Rogers* 24460 (T.M.); Camperdown district: near, river Umlaas, *Evans* 345 (N.); Impendhle district: Boston, *Wylie* [Wood 9928] (B.M.); Inanda district: Inanda, *Rehmann* 8420 (Z.); edge of wood, Inanda, *Wood* 5589 (B.); Inanda, *Wood* 289 (B.M., N., K., S.A.M., B.H.); Zululand, Eshowe district: margins of forest, Eshowe, *Galpin* 12159 (K., V., P.); Eshowe, *Rogers* 24460 (Z., A.M., W.); *Forbes* [N.H. 20538] (N.); *Forbes* 708 (N.); plantations, Port Durnford, *Kotze* 22 (P.); Nkandhla district: Melmoth, *Mogg* 4574 (P.); Babanango, *King* 450 (N.); Ngoye, *Wylie* [Wood 10363] (Pa.); no definite locality, *Gerrard* and *McKen* 302 (K., B.M., Pa., V.); *Gerrard* 1087 (K.); *Gerrard* 1752 (K., B.M., Pa.).

NO DEFINITE LOCALITY.—*Ecklon* and *Zeyher* 1629 (O., Pa., G., V., B.); *Zeyher* 2395 (P.); *Barber* (A.M.); *Drège* [Herb. E. Meyer 5468] (B.); *Drège* [Herb. E. Meyer 5469] (B.); *Drège* 415 and 416 (V.); *Drège* (O.); *Drège* 2395 (V.); *Ecklon* and *Zeyher* 810 (Z.); *Krebs* 110 (G.); *Krebs* s.n. (B.); *Rohde* (V.); Talbot (K.); *Verreaux* (G.); *Burchell* 3867 (K.); *Cooper* 2224 (K.); *Corvailla* (V.); *Hennegart* (P.); *Mund* and *Maire* (B.); *Masson* (B.M.).

A decoction of the root of this plant, known to the Zulus as "ihlozane" is used as a parasiticide.

55. **T. glomeruliflora** Meisn. in Hock. Lond. Journ. Bot. 2.86 (1843); Cape Plants, Krauss and Engler 54 (1846); Harvey in Harv. and Sond. Fl. Cap. 2.209 (1861-62); Wood Fl. Natal 42 (1907); Wood in Trans. S.A. Phil. Soc. 18.2.147 (1908); Bews Fl. Natal and Zululand 111 (1921).

Type specimen, *Gueinzius*, in Herbarium, Kew.

Suffruticose, erect, whole plant more or less greyish pubescent. *Stems* branching, terete. *Leaves*—3-12-jugate, 3 10·5 cm. long, petiolate; leaflets 1·5-4 cm. long, 0·5-1·2 cm. broad, narrow oblong, obtuse or subacute, mucronate, thinly pilose or glabrous above, more or less densely canescent below; petiolules about 2 mm. long. *Stipules* lanceolate or ovate-lanceolate, striate, 0·5-1 cm. long. *Peduncles* terminal and leaf-opposed, 11-20 cm. long. *Flowers* 1·8-2·2 cm. long 2-3 together in interrupted spicate glomerules. *Bracts* ovate, acuminate, 0·9-3·5 cm. long, deciduous. *Pedicels* up to 1·2 cm. long, short at first but lengthening as the flower develops. *Calyx*-tube 0·9-1·5 cm. in diam., lobes 3-5 long and two upper connate and slightly shorter. *Vexillum* sericeous without, 1·8-2 cm. mm. long, and broad. *Ovary* 1·4-1·8 cm. long, densely hairy along sutures. *Style* 0·6-1 cm. long, bearded. *Legumes* hairy along sutures, compressed, 5-6 cm. long, 8-9 mm. broad.

CAPE.—Pondoland: hillside, Signal Hill, Port St. Johns, *Galpin* 9537 (K., P.); forests, Port St. Johns, *Moss* 2740 (W.); amongst rocks in sea sand, Port St. Johns, *Houlett* 52 (P.).

NATAL.—Port Shepstone district: sandy grassy places near beach, Uvonga, *Thode* (B., S.); Umzinto district: Park Rynie, *Wood* 12367 (N., P., T.M.); Friedenau, Umgaiflat, *Rudatis* 280 (B., P.); Durban district: Port Natal, *Gueinzius* (K.); Berea, Durban, *Wood* 4843 (B.M., G., N., P., B.H.); cult. in Botanic Gardens, Durban, *Wood* 12564 (K., N.); Sydenham, *Wood* 11927 (A.M.); Rooikop near Sydenham, *Forbes* 543 (N., T.M.); Springfield, *Wood* 13062 (N., T.M.); Pinetown district: inter Pinetown and Umbilo, *Rehmann* 8044 (K.); Greytown district: near Greytown, *Wood* 5984 (V., B., B.H., N.); Impendhle district: Boston, *Wood* 11400 (N.); Tugela district: Chaka's Kraal, *Thode* (B.); Zululand, Mtunzini district: Mtunzini, *Wood* 11360 (N., P.); *Mogg* 4348 (A.M., P., B.H.); Eshowe district: Port Durnford Plantations, *Kotze* 22 (P.); Ngoye, *Wylie* [Wood 10345]

(N., P.); Wood 10363 (P.); Wylie [Wood 8482] (B.); Wylie [Wood 5654] (G., P.); open ground, Wood 722 (B.M., B.); Wood 3865 (K., S.A.M., B.M.); Umfolosi district: St. Lucia Bay, Pole-Evans 3647 (P.).

NO DEFINITE LOCALITY.—Gueinzus 306 (V.).

56. **T. subulata** Hutch. and Burt Davy in Fl. Tvaal. 1.2. p. XXI and p. 377 (1932).

Type specimen, Galpin 843, in Herbarium, Kew.

Suffruticose, stems erect or ascending. Leaves pinnate, 4–8-jugate, 5–10 cm. long; leaflets 1–4.3 cm. long, 0.5–1.5 cm. broad, oblong, retuse, mucronulate. Stipules broad, more or less ovate, striate, sparsely ciliate and pilose without. Peduncles terminal and axillary, up to 2 cm. long, few flowered. Flowers 1.5–2 cm. long; bracts acute, 5–7 mm. long, striate, subglabrous, caducous; pedicels 6 mm. long. Calyx-tube 2.5–3 mm. long, 8 mm. in diam., lobes linear-subulate, 4–7 mm. long, much longer than the tube, subglabrous. Vexillum 1.5–1.7 cm. long, 1.1–1.8 cm. broad, pubescent without. Ovary 1.1–1.5 cm. long, thinly hairy along the sutures. Style 5 mm. long, bearded along the inner side. Immature pods 4.5 cm. long, 0.6 cm. broad, glabrous.

CAPE.—East Griqualand: in graminosis ad rivulos “Clydesdale” ad flumen Umzimkulu, Tyson 1434 (K., A., G., V., B., P., S.A.M., S.); apud rivulos circa Clydesdale, Tyson 2047 (K., Z., P.).

NATAL.—Umzinto district: Friedenau, Umgai Flat, Rudatis 308 (B.); Pinetown district: Trappisten Kolonie, Mariannahill, Landauer 236 (B.); Greytown district: grassy places near streams, De Rust, Greytown, Thode (B.).

TRANSVAAL.—Barberton district: Highland Creek, Barberton, Galpin 843 (K., N., P., S.A.M.); Moodies Hill near stream, Thorncroft (K., T.M.); Roses Creek, Thorncroft 36 (T.M.).

57. **T. shiluwanaensis** Schinz in Vierteljahrsschr. Nat. Ges. Zurich 52.425 (1907); Burt Davy Fl. Tvaal. 1.2.379 (1932).

Syn. *Tephrosia spathacea* Hutch. and Burt Davy in Fl. Tvaal. 1.2. pp. XXXI and 377 (1932) in part.

Tephrosia Meisneri Hutch. and Burt Davy l.c.

Type specimen, Junod 2355, in Botanisches Museum, Zurich.

Suffruticose, erect, sparsely branched, branches grey-pilose when young, at length glabrous. Leaves 3–6-jugate, petiolate, 5.5–13 cm. long; leaflets oblong-obovate or cuneate, truncate or emarginate, mucronate, glabrous above, thinly appressedly grey-pilose below, 1–4.5 cm. long, 0.4–1.3 cm. broad. Stipules ovate-acuminate, pilose, densely ciliate along the margins, 0.5–1 cm. long. Peduncles axillary and terminal, racemously few-flowered at apex, 8–11 cm. long, terminal peduncle occasionally up to 20 cm. long; pedicels 2–9 mm. long; flowers subtended by broad ovate bracts, soon caducous. Flower 1.5 cm. long. Calyx long pilose, tube 3 mm. long, 8 mm. in diam., lobes unequal, 2.5–3.5 mm. long. Vexillum densely clothed with adpressed silky golden-brown hairs without, about 1.5 cm. long and 1.4 cm. broad. Ovary 1.1 cm. long. Style 5 mm. long, bearded along inner side. Legume 4 cm. long, 7 mm. broad, glabrous.

TRANSVAAL.—Zoutpansberg district: bas pays, Shiluwane, Junod 2355 (Z., G.); Junod 1106 (K., Z.) [cited as *T. spathacea* in Fl. Tvaal.]; Junod 117 (Z., G.); in cliv. mont. Houtboschberg, Schlechter 4417 (B.); Houtbosch, Rehmann 6228 (K.); and 6229 (K., Z.); Lydenburg district: hillsides, Sabie Valley, Galpin 13598 (B.M., P.); Governments Spruit, north of town, Lydenburg, Wilms 341 (K.), [type of *T. spathacea* Hutch. and B. Davy] Spitzkop Goldmine, Wilms 341 bis (Pa., G.); Louis Trichardt, Young, in Herb. Moss 17248 (W.); Ermelo district: rock crevices, Blaaupan A. Moss 16326 (W.).

58. **T. albissima** H. M. Forbes sp. nov., affinis *T. macropodae* Harv., sed caulibus multo brevioribus, omnibus partibus dense longeque albido-pilosis, lobis calycis tubo longioribus differt.

Caules simplices, ascendentes vel decumbentes, e basi ramosi, pilis longis albidis pilosi. *Folia* 1-6-jugata, 2.5-11 cm. longa; foliola obovato-cuneata, retusa, mucronata, 2.5-5.5 cm. longa, 0.8-2.2 cm. lata, supra glabra, subtus pilosa; stipulae ovatae, pilosae, 0.7-1.5 cm. longae, 3-5 mm. latae, 5-7 nervatae; pedunculi 7-12 cm. longi; bractae ovatae, mox caducae. *Flores* 1.8-2 cm. longi; pedicelli 5-8 mm. longi; dentes calycis lineari-lanceolati tubo excedentes; ovarium marginibus pilosis; stylus pilosus.

Type specimen, *Wylie* (N.H. 21590), in Natal Herbarium, Durban.

Stems simple, ascending or decumbent, branching from the base, clothed with long white hairs. *Leaves* 1-6-jugate, 2.5-11 cm. long; leaflets obovate-cuneate, retuse, mucronate, glabrous above, pilose below, 2.5-5.5 cm. long, 0.8-2.2 cm. broad. *Stipules* broad, ovate, 5-7 nerved, pilose, 0.7-1.5 cm. long, 3-5 mm. broad. *Peduncles* terminal, 7-12.5 cm. long, flowers almost capitate in a short dense raceme at the apex. *Flowers* purple, 1.8-2 cm. long; pedicels 5-8 mm. long, pilose, bracts ovate, soon caducous. *Calyx* pilose, lobes longer than tube, linear-lanceolate. *Ovary* with margins densely pilose. *Style* bearded.

NATAL.—Krantzkop district: Greytown, *Wylie* (N.H. 21590) (N., P.).

59. **T. cordata** Hutch and Burt Davy in Fl. Tvaal. 1.2 p. XXXI and p. 377 (1932).

Type specimen, *Burt Davy* 2886, in Herbarium, Kew.

Suffruticose. *Stems* ascending, soon glabrescent. *Leaves* pinnate, 5-6-jugate, 3-13.5 cm. long; leaflets oblong, 1-3.4 cm. long, 0.4-1.7 cm. broad, mucro up to 2 mm. long, glabrous above, thinly appressedly pilose beneath. *Stipules* broadly cordate at base, broadly ovate, very acute, 1-2.5 cm. long, 0.5-1.2 cm. broad. *Peduncles* terminal, few-flowered towards apex, 4-14 cm. long, pedicel 0.5-1 cm. long. *Calyx* pilose, tube 9 mm. in diam., 3 mm. long, lobes lanceolate, all about 2 mm. long. *Vexillum* pilose without, 1.4 cm. broad, 1.6 cm. long. *Ovary* 1.3 cm. long, hairy along the margins. *Style* 8 mm. long, bearded along inner surface. *Legumes* 3.5-5 cm. long, 6-8 mm. broad, glabrous, narrow-oblong, flat.

TRANSVAAL.—Ermelo district: crevices, Blaaupan A. Moss 16326 (W.); Carolina district: Billy's Vlei, *Mitchell* (Pa.); Lydenburg district: Kluft bei Stephen Schumaan l. v. Lydenburg, *Wilms* 344 (B.M., B.); amongst rocks, Suikerbos Kop, Dullstroom, *Galpin* 13134 (K., B.H., P.); Barberton district: Kaapsche Hoop, *Rogers* 21041 (P.); *Rogers* 21111 (K., B.M., Z., P., W.); Duivels Kantoer near Kaapsche Hoop, *Pole-Evans* 1001 (P.); Zoutpansberg district: Louis Trichardt, *Young* in Moss Herb. 17248 (W.).

SWAZILAND.—In kloofs, Mbabane, *Burt Davy* 2886 (K., B.M., P.); *Rogers* 11610 (B.H.); grassy hillsides near Dalriach, Mbabane, *Bolus* 11819 (B.H.).

PORTUGUESE EAST AFRICA.—Mozambique, *Schlechter* s.n. (B.).

60. **T. spathacea** Hutch. and Burt Davy Fl. Tvaal. 1.2. pp. XXXI and 377 (1932).

Suffruticose. *Stems* erect or ascending, thinly pilose when young, glabrous later. *Leaves* 2-4-jugate, 2.5-8 cm. long, petioled; leaflets elliptic- or oblong-cuneate, mucronate, thinly pilose below when young, glabrous on both sides later, 1.5-3 cm. long, 0.6-1.5 cm. broad. *Stipules* ovate-acuminate, up to 1 cm. long, 0.5-0.6 cm. broad. *Peduncles* terminal and leaf-opposed, few-flowered towards apex. *Flowers* small, bracts acuminate. *Calyx* teeth scarcely exceeding the tube, subulate acuminate. *Legumes* linear, flat, very sparsely ciliate along sutures, later quite glabrous.

TEMBULAND.—In collibus prope flumen Chwenka, *Bolus* 8877 (P.).

NATAL.—Maritzburg, *Phillips* 3461 (P.); Zululand, Mahlabathini, *Gerstner* 4247 (N.).

SWAZILAND.—Hlatikulu, *Pierce* (P.).

TRANSVAAL.—Middelburg district: Pan, Middelburg, *Burt Davy* 13254 (P.); *Hodgson* (P.); near Witbank Stn., *Gilfillan* (P.); Zoutpansberg district: New Agatha, *McCallum* (P.).

61. **T. Galpinii** H. M. Forbes sp. nov., affinis *T. albissimae* H. M. Forbes, sed caulibus longioribus, foliis nunquam albido-pilosis, lobis calycis tubo aequilongis differt.

Caules ascendentes vel decumbentes. *Folia* 1-4-jugata, 2.5-8 cm. longa; foliola elliptica vel oblongo-cuneata, mucronata, 2-4 cm. longa, 0.5-0.7 cm. lata, supra glabra subtus leviter pubescentia vel glabrescentia; pedunculi 10-22 cm. longi; bractae ovatae 5-7 mm. longae, mox caducae. *Flores* 1.3-1.5 cm. longi; dentes calycis tubo aequilongi; stylus leviter pilosus. *Fructus* non visus.

Type specimen, *Galpin* 14755, in National Herbarium, Pretoria.

Stems ascending or decumbent, simple or branching a little, glabrescent. *Leaves* petioled, 1-4-jugate, 2.5-8 cm. long; leaflets elliptic- or oblong-cuneate, mucronate, glabrous on both sides or sparsely appressedly pubescent below, 2-4 cm. long, 0.5-1.5 cm. broad. *Stipules* broadly ovate, acuminate, 1 cm. long, 0.5-0.7 cm. broad. *Peduncles* 10-22 cm. long, terminal and axillary, few flowered towards apex. *Bracts* ovate, 5-7 mm. long, soon caducous. *Flowers* purple, 1.3-1.5 cm. long. *Calyx* glabrous or very sparsely pilose, calyx teeth equal in length to tube. *Style* thinly bearded. *Legumes* not seen.

NATAL.—Greytown district: Greytown, *Galpin* 14755 (P., N.); *Galpin* 14727 (P.); *Wylie* (N.).

The late Mr. E. E. Galpin, in whose honour this plant has been named, was well-known in the botanical world. He was an indefatigable collector and a keen botanist, and his contribution to the botanical knowledge of South Africa is invaluable.

62. **T. unifolia** H. M. Forbes sp. nov., affinis *T. Galpinii* H. M. Forbes, sed caule brevior, folio unico, nervis secundis nigrescentibus differt.

Caules decumbentes vel ascendentes, graciles, parce pubescentes. *Folia* 1-3-jugata, 0.5-1.7 cm. longa; foliola elliptico-oblonga, mucronata, supra glabrescentia pallidaque, subtus parce pubescentia, usque ad 7 mm. longa; pedunculi 7-23 cm. longi, pauciflorae; bractae ovato-acuminatae, 3-4 mm. longae. *Flores* 1.6-1.7 cm. longi; pedicelli 5.5-8 mm. longi; dentes calycis tubo subaequilongi; stylus pilosus. *Fructus* complanatus.

WESTERN ZULULAND.—No definite locality, March 1895, *Baker* [*Evans* 566]. Type in Natal Herbarium.

Stems decumbent or ascending, slender, thinly pubescent. *Leaves* shortly petioled, 1-3-jugate, 0.5-1.7 cm. long; leaflets elliptic-oblong, mucronate, mucro usually recurved, glabrous and light green above, thinly hirsute, secondary veining dark below, 1.7-4.5 cm. long, 0.4-1 cm. broad. *Stipules* ovate-acuminate, up to 7 mm. long. *Peduncles* 7-23 cm. long, laxly few-flowered towards apex. *Bracts* subtending young flowers, ovate, acuminate, 3-4 mm. long, soon caducous; pedicels 5.5-8 mm. long. *Flowers* purple-red, 1.6-1.7 cm. long. *Calyx* pubescent, lobes sub-equal to or very slightly longer than tube. *Vexillum* densely silky without. *Style* bearded. *Legumes* (immature) 3.5 cm. long, 6 mm. broad, flat, appressedly hairy along sutures.

Only one gathering of this plant was seen. Apparently several stems arise from the root-stock, each stem bearing only one leaf and one or two peduncles.

63. **T. radicans** Welw. ex Baker in Oliv. Fl. Trop. Afr. 2.121 (1871); O. Kuntze Rev. Gen. Pl. 1 (1891); Die Veg. der Erde 9.589 (1915); Bak. f. Leg. Trop. Afr. 1.214 (1926).

Syn. *Cracca radicans* (Welw.) O. Kuntze, Hiern in Cat. Afr. Pl. Welw. 122; *Tephrosia radicans* Welw. var. *rhodesica* Bak. f. in Journ. Bot. 37.430 (1899).

Type specimen, *Welwitsch* 2082, in Herbarium, British Museum (Natural History), South Kensington, London.

A wide trailing perennial herb with copiously branched, slender, flexuous, prostrate stems, 6-9 m. long, densely clothed with fine spreading pubescence. *Leaves* petiolate, 5-7-jugate; leaflets obovate-oblong, truncate, mucronate, grey-green and glabrescent above, persistently grey-silky below, midrib tawny, 0.7-2.5 cm. long, 0.4-1.3 cm. broad. *Stipules* ovate, 3-5 mm. long. *Peduncles* usually terminal, laxly 6-15 flowered, 2.5-10 cm. long. *Flowers* 1-1.1 cm. long; pedicels 0.3-1 cm. long; bracts lanceolate, minute. *Calyx* pubescent, tube 5-7 mm. in diam., 2-2.5 mm. broad, lobes lanceolate, cuspidate, two upper approximately 1.5 mm. long, lateral and lowest 2-3 mm. long. *Vexillum* silky on back, 1-1.1 cm. long, 7-8 mm. broad. *Ovary* 4-5 mm. long, densely and finely pubescent. *Style* bearded along inner surface. *Legumes* 2-3 seeded, oblong, 1-2.5 cm. long, 5-7 mm. broad, pubescent.

ANGOLA.—Huilla, in pratis humidis ad formicar monticul de Varzeas de Catumba, *Welwitsch* 2082 (K., B.M., Pa., G., B.): high plateau between Humpata and Lubuyo, *Pearson* 2589 (K., B.).

TRANSVAAL.—Pietersburg district: in plantiebus graminosis prope pagum, Pietersburg, *Botus* 10876 (K., V., B., Z., N., S.A.M., B.H.): Makapansberge, Streydpoort, *Rehmann* 5529 (K.): Marabstad, *Schlechter* 4679 (B., A.M., T.M., Pa., B.H.); Pyramid Estate near Potgietersrust, *Galpin* 8959 (Z., P.); Barberton district: near Research Station, Nelspruit, *Liebenberg* 2581 (P.).

SOUTHERN RHODESIA.—Plumtree, *Eyles* 3295 (S.A.M., B.H.): Bulawayo, *Rogers* 13662 (P., S.A.M., A.M.): *Rand* 52 (B.M., A.M.): Matopos, *Rattray* 407 (B.M.); *Flanagan* 3099 (B.H.): Lydiate Siding, *Eyles* 955 (K., S.A.M.): Odanzi River Valley, *Teague* 471 (K., H.B., S.A.M.): no definite locality, *Hislop* 779 (K.).

NORTHERN RHODESIA.—Makolu, *Young* 6 (B.M.): Kalomo, *Rogers* 820 (K.): *Trapnell*: 1015 (K.): Choma, *Rogers* 8011 (K., A.M., Z.): Mazabuka, *Rogers* 8730 (K., N., T.M.) *Rogers* 25127 (K., Z., T.M.): Mumbuwa, *Macaulay* 391 and 1151 (K.).

In the Journal of Botany 37.430 (1899), Baker fil., describes a variety, var. *rhodesica*, which he says differs from *T. radicans* as follows: "Leaflets generally 7, rather broader than in the type. Legume broader than type." In my opinion I do not think this variety can stand, for the type specimen, *Welwitsch* 2082, has quite a few leaves with seven leaflets, also the breadth of the leaflets and legumes is too variable a character to differentiate between typical *T. radicans* and the variety.

64. *T. zuluensis* H. M. Forbes sp. nov., affinis *T. macropodae* sed petiolis brevioribus differt.

Caules decumbentes vel ascendentes, pubescentes. *Folia* 2-3-jugata, 1 cm. longa, petiolis brevibus; foliola cuneato-oblonga, obtusa, mucronulata, 1.7-3.5 cm. longa, 0.75-1.5 cm. lata, supra glabra, subtus parce pubescentia; stipulae ovato-cordatae, acuminatae, 5-6.5 mm. longae, 3.5-5 mm. latae; pedunculus usque ad 24 cm. longus; bractae ovatae, usque ad 6.5 mm. longae. *Flores* 1.5 cm. longi; pedicelli 5.5 mm. longi, pubescentes; dentes calycis lanceolati, tubo excedentes; stylus pilosus. *Fructus* circiter 4.2 cm. longus, 0.6 mm. latus, marginibus hirsutis.

ZULULAND.—Nkandhla, J. Wylie (Wood 8966) in Natal Herbarium, Type.

Stems procumbent or ascending, pubescent. *Leaves* 2-3-jugate, 1 cm. long, petioles very short; leaflets cuneate-oblong, obtuse, mucronate, glabrous above, thinly pubescent and with dark brown secondary veining below, 1.7-3.5 cm. long, 0.75-1.5 cm. broad;

petiolules 1 mm. long, densely pilose. *Stipules* ovate-cordate, acuminate, pilose, 6-8-nerved, 5-6.5 mm. long, 3.5-5 mm. broad. *Peduncles* terminal and axillary, up to 24 cm. long, few-flowered at apex. *Bracts* broadly ovate, pilose, up to 6.5 mm. long, soon caducous; pedicels up to 5.5 mm. long, lengthening as flowers develop, pilose. *Flowers* 1.5 cm. long, purple. *Vexillum* suborbicular, densely silky without. *Calyx* lobes longer than the tube, lanceolate, long pilose. *Style* bearded. *Legumes* (immature), 4.2 cm. long, 6 mm. broad, flat, pilose along margins, 7-8 seeded.

Except for the very short petioles, this plant has the appearance of *T. macropoda*, particularly the more robust forms of that species.

65. **T. macropoda** Harv. in Harv. and Sond. Fl. Cap. 2.210 (1861-62); O. Kuntze Rev. Gen. Pl. 1.175 (1891); Zahlbr. Ann. K. K. Naturhist. Hofmus. 20.3.25 (1905); Wood Fl. Natal 42 (1907); Wood in Trans. S.A. Phil. Soc. 18.2.147 (1908); Marloth Diot. Common Names 112 (1917); Pott in Ann. Tvl. Mus. 6.4.128 (1920); Bews Fl. Natal and Zululand 111 (1921); Watt and Breyer-Brandwyk Med. and Pois. Pl. S.A. 74 (1932).

Syn. *Apodynomene macropoda* E. Mey. Comm. Pl. Afr. Austr. 112 (1836); Hook. Lond. Journ. Bot. 2.88 (1843); Cape Plants, Krauss and Engler 54 (1846); *Tephrosia triphylla* Harms. in O. Kuntze Rev. Gen. Pl. 3.2.57 (1893). *Cracca macropoda* (E. Mey) O. Kuntze Rev. Gen. Pl. 3.2.57 (1893).

Type specimen, *Drège* (Herb. Meyer 5471), in Botanisches Museum, Berlin-Dahlem.

The two co-type specimens *Drège* (inter Gekau and Bashee) and *Drège* (inter Omtata and Omgaziana) are in the Herbarium, Kew.

Stems several from a large tuberous root-stock, procumbent, more or less robust, up to 3 feet long. *Leaves* 1-3-jugate, 6-14.5 cm. long, petioles usually long before first pair of leaflets; leaflets narrow to broadly elliptical or oblong, glabrous above, pubescent or glabrescent below, 2-6.5 cm. long, 0.6-3 cm. broad. *Stipules* broadly cordate-ovate, 0.5-1.2 cm. long, 0.5-1 cm. broad. *Peduncles* terminal and leaf-opposed, up to 48 cm. long, few-flowered at apex; bracts broadly ovate, bilobed at apex, soon caducous, 0.7-1.3 cm. long. *Flowers* large, 1.4-2.2 cm. long. *Calyx*-teeth linear to linear-lanceolate, longer than tube. *Style* bearded. *Legumes* linear, flattened, glabrous, hirsute along sutures, up to 6 cm. long and 0.8 cm. broad.

CAPE.—Albany district: grassy places, Botha's Hill Spruit, *MacOwan* 452 (N., S.A.M.); Kingwilliamstown district: Keiskamma, *Hutton* (K.); Komgha district: grassy hills near Komgha, *Flanagan* 511 (G., P., S.A.M., B.H.); Kentani, *Pegler* 1362 (P., B.H.); Transkei district: inter Gekau and Bashee, *Drège* (K.); Umtata district: in monte Engcobo, *Bolus* 8877 bis (B.H., P.); Baziza, *Baur* 59 (K.); inter Omtata and Omgaziana, *Drège* (K.).

NATAL.—Port Shepstone district: Port Shepstone, *Weeks* 44 (W.); Beach Terminus, *Thode* (S.); flats behind dunes, Marburg, *Backmann* 608 (B.); Dumisa, *Rudatis* 874 (K., B.M., V., Z., G., B., P.); Ixopo district: Ixopo, *Mogg* 2299 (P.); Scottburgh, *Howes* (P.); Mid Illovo, *Thode* (S.); Durban district: Merebank, *Wood* 235 (N., B.M., S.A.M., B.H.); Hilltop, Brighton Beach, *Forbes* 512 (N.); Jacobs, *Conrath* 236 (Z., B.); Port Natal, *Sutherland* (K.); Port Natal, *Gueinzus* 28 (V.); Port Natal, *Krauss* 451 (K., B.M., G., P.) and *Krauss* 244 (K., B.M., G.); near Durban, *Wood* 5494 (Pa., B.); Umgeni, *Rehmann* 8701 (Z.); Pinetown district: Pinetown, *Acutt* (P.); New Germany, *Indian Collector* (N.); among grass, Fields Hill, *Evans* 178 (N.); Krantzklouf, *Kuntze* (K.); Inchanga, *Engler* 2638 (B.); *Stohr* 27 (B.M.); *Frith* 122 (W.); Drummond, *Galpin* 10299 (P.); Bothas Hill, *McClellan* 102 (P., N.); Camperdown district: Camperdown, *Franks* (K., N.); *Rehmann* 7722 (Z.); Pietermaritzburg district: Pietermaritzburg, *Wilms* (K., B.M.); Alberton near Maritzburg, *Mogg* 2177 and 6590 (P.); Cedara, *Phillips* 3461 (P.); Shafton, *Howick*, *Evans* (N.); Inanda district: Avoca, *Oliver* 158 (N.); in graminosis, Phoenix, *Schlechter*

2904 (B., A.M.); Oakfort, *Rehmann* 8514 (Z.); Inanda, *Wood* 816 (K., B.M., N., P.); Zululand, Mtunzini, *Mogg* 4436 and 5812 (P.); Eshowe, *Gerstner* 3830 (N.). No definite locality, *Gerrard* 31 (V., Pa., B.M.).

TRANSVAAL.—Witwatersrand district: Brakpan, *Murray* (O.); Pretoria district: Koedoespoort, *Rehmann* 4629 (Z.); Middelburg district: Waterval Boven, *Rogers* 14405 (B.M., Z., W.); Dullstroom, *Galpin* 13074 (K., P.); Witbank, *Rand* 45 (B.M.); Middelburg *Hewitt* (T.M.); Barberton district: eastern slopes, Saddleback Mountains, *Galpin* 1172 (P.); top and upper parts of Mt. Schagen, Barberton, *Liebenberg* 2498 (P.); Tweefontein Experimental Area, Sabie, *Wager* B.172 (P.); between Pilgrims Rest and Sabie, *Rogers* 21765 (Z.); Pietersburg district: Houthbosch, *Rehmann* 6232 (Z.); The Downs, Pietersburg, *Moss* and *Rogers* 325 and 326 (P.); Modjadjes near Pietersburg, *Rogers* 18029 (Z.); Zoutpansberg district: Messina, *Moss* and *Rogers* 25 bis (Z.); in clivis Mt. Elandspruitbergen, *Schlechter* 3997 (Z.).

ORANGE FREE STATE.—Bloemfontein, *Snoek* (G.U.C.).

SOUTH AFRICA.—No definite locality: *Drège* 417 (V.); *Drège* (O.); *Hennegart* (Pa.). *Gueinzus* (K., Pa., V., AM., S.); *Gerrard* and *McKen* (K., B.M., Pa., V.); *Junod* 904 (Pa.); (G., Z) and 2532 (Z.); *Rehmann* 6231 (Z.) [cited as *T. spathacea* in Fl. Tvaal.]; *Watt* and *Brandwyk* 686 (P.).

T. macropoda is an extremely variable species. Meyer, in his description in Comm. Pl. Afr. Austr., divides the material into two varieties, as follows:—

A. *latifolia*. Leaves 2–3–jugate, leaflets broad, oblong, obtuse, roughly hairy below or subglabrous; peduncles generally hispidulous.

B. *angustifolia*. Leaves 3–5–jugate, leaflets lanceolate–oblong, sericeous–argenteous; peduncles glabrescent or sparsely appressedly pilose.

Harvey in “Flora Capensis” does not maintain the varieties.

After a preliminary examination of a large amount of material, it seemed feasible to resuscitate the variety *angustifolia*. A further study of the material, however, showed that it would be very difficult to differentiate clearly, except between the forms with the very broad leaflets and the forms with the very narrow leaflets, for leaflets on the same specimen vary from broad to medium and medium to narrow.

The form with the narrowest leaflets seems to occur chiefly in the Eastern Province of the Cape and is very frequently confused with *T. aemula*. The most robust form with very broad leaflets occurs chiefly along the coastal areas of Natal and Zululand. Further inland in Natal and throughout the Transvaal the plants become less robust and the leaflets narrower.

Another variable character is the trifoliate leaf, a character which led Harms to describe this plant as *T. triphylla*. Sometimes all the leaves on one stem will be trifoliate while other stems arising from the same root-stock will bear 2–3–jugate leaves.

Three specimens collected by Tyson in East Griqualand are, in my opinion, dwarf forms of *T. macropoda*. The stems and petioles are shorter than in typical *T. macropoda*, but they agree otherwise.

These specimens are *Tyson* 1430 (K., S.A.M., P.); *Tyson* 1579 (K., B.H.) and *Tyson* 2092 (K., S.A.M., B.H.).

This plant is widely known as a fish-poison and the Zulus also use the powdered root as an insecticide, as well as for medicinal purposes. The Zulu name is “iLozane.”

66. *T. aemula* (E. Mey) Harv. in Harv. and Sond. Fl. Cap. 2.210 (1861–62); O. Kuntze Rev. Gen. Pl. 1.174 (1891); *Wood* Fl. Natal 41 (1907); *Wood* in Trans. S.A. Phil. Soc. 18.2.147 (1908); Bot. Survey S.A. Mem. 1.64 (1919); *Bews* Fl. Natal and Zululand 110 (1921).

Syn. *Apodynomene aemula* E. Mey. Comm. Pl. Afr. Austr. 113 (1836). *Cracca aemula* (E. Mey.) O. Ktze. Rev. Gen. Pl. 3.2.57 (1893).

Type specimen, *Drège* s.n. in Botanisches Museum, Berlin-Dahlem.

Subherbaceous. *Stems* very slender, procumbent, glabrous or thinly pubescent. *Leaves* 1-2-jugate, 3-11 cm. long, long petioled; leaflets elliptic or cuneate-oblong, subobtusate, mucronulate, glabrous above, thinly appressedly pubescent below, 1-2.5 cm. long, 0.5-0.8 cm. broad. *Stipules* ovate, acuminate, 4-6 mm. long. *Peduncles* terminal and leaf-opposed, 10-25 cm. long, laxly few-flowered at apex; bracts ovate, bi-lobed at apex, 4-6 mm. long, caducous. *Flowers* 0.8-1.3 cm. long. *Calyx*-teeth subulate, acuminate, sub-equal to or slightly longer than tube. *Style* bearded. *Legumes* linear, flat, 2.7-3.5 cm. long, 0.5-0.7 cm. broad, glabrous or very shortly appressedly pubescent along margins, about 10-seeded.

CAPE.—Komgha district: between Zandplaat and Komgha, *Drège* (B.); Cape, Belfort, *Jacottet* 124 (Z.).

NATAL.—Alexandra district: Dumisa, *Rudatis* 885 (B.M., V., G., P.); Durban district: pr. Durban, *Wood* (N.); *Wood* 6356 (K., N.); Clairmont, *Wood* 8027 (N.); Merebank, *Wood* 234 (B.M.); Pinetown district: Trappisten Kolonie, Mariannhill, *Landauer* (B.).

This species is frequently confused with the narrow-leaved form of *T. macropoda*. It may be distinguished, however, by its 1-2-jugate leaves, more slender stems, etc., and its more glabrescent habit.

67. *T. diffusa* Harv. in Harv. and Sond. Fl. Cap. 2.210 (1861-62); O. Kuntze Rev. Gen. Pl. 1.175 (1891); *Wood* Fl. of Natal 41 (1907); *Wood* in Trans. S.A. Phil. Soc. 18.2.147 (1908); Burt Davy and Potts in Ann. Tvl. Mus. 3.3.146 (1912); Bews Fl. Natal and Zululand 110 (1921); Watt and Breyer-Brandwyk Med. and Pois. Pl. of S.A. 74 (1932).

Syn. *Apodynomene diffusa* E. Mey. Comm. Pl. Afr. Aust. 113 (1836). *Cracca diffusa* (E. Mey.) O. Kuntze Rev. Gen. Pl. 1.175 (1891).

Type specimen, *Drège* (Herb. Meyer 5478), in Botanisches Museum, Berlin-Dahlem.

Suffruticose, procumbent. *Stems* and branches subfiliform. *Leaves* 2-4-jugate, 2-4 cm. long, long petioled; leaflets subcuneate-oblong, appressedly puberulous, 0.8-2.5 cm. long, 3-7 mm. broad. *Stipules* ovate, striate, 5-7 mm. long, 2-3 mm. broad near the base. *Peduncles* leaf-opposed, few flowered, 1.5-6 cm. long. *Flowers* subtended by ovate, deciduous bracts, 5-6 mm. long and deeply bi-lobed at apex. *Calyx*-tube 2 mm. long, 6 mm. in diam., lobes unequal, subulate, acuminate, very shortly ciliate, four lobes equalling tube, lowest longer. *Vexillum* 1.3 cm. long, 0.9 cm. broad. *Stamens* diadelphous. *Style* about 5 mm. long, thinly bearded. *Legumes* subglabrous, 2-2.5 cm. long, 4 mm. broad.

CAPE.—East Griqualand: Kokstad, *Thode* (B.); New Amalfi, *Forbes* 1123 (N.); hill-side above Matatiele, *Galpin* 14077 (N., P.); Pondoland: inter Omsamouba and Omsamcaba, *Drège* [Herb. Meyer 5478] (K., B.); Pondoland, *Beyrich* 256 (B.).

NATAL.—Inanda district: Inanda, *Wood* 886 (K., N.); Umhloti, *Wood* 713 (K., N.); Harding district: Murchison Flats near Oribi Flats, *McClellan* 305 (N., P.); Bulwer district, top of the Peak, Byrne, *Galpin* 11974 (K., V., Pa., P., B.H.); New Hanover district: Noodsberg, *Wood* 886 (N.); Drakensberg district: Dooley Slopes, Mont-Aux-Sources: *Bayer* and *McClellan* 206 (P.); Umlambonya Valley, Cathedral Peak Area, *Schelppe* 977 (N.).

This plant is called "iHlozane" by the Zulus, who use it as a parasiticide. It is said to be very poisonous.

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EXCLUDED SPECIES.

T. avasmontana Dtr.—*Dolichos linearis* E. Mey.
T. oblongifolia E. Mey.—*Ophrestia oblongifolia*
(E.M.) H.M. Forbes.

11. THE GENUS OPHRESTIA Forbes Gen. Nov.

In the course of an examination of the South African material of the genus *Tephrosia*, the marked difference of the venation of the leaflets of *T. oblongifolia* E. Mey. to those of any other species of this genus was noticed. One of the most conspicuous characteristics of *Tephrosia* is the close parallel veining of the leaflets, and this feature is not present in *T. oblongifolia*, whose leaflets show 5-7 prominent veins.

Burt Davy also appears to have been puzzled by this plant, for, according to a note attached to a sheet in the National Herbarium, Pretoria, he made a new combination, *Glycine oblongifolia* (E. Mey.) B. Davy, which, however, he did not publish. In "The Flora of Transvaal and Swaziland" I, 2 (1932) he adheres to the old name, although he used the distinctive character of "4-5 veins" to key out the species.

In Engler's Jahrb. 26, 302 (1899) Harms described a Transvaal plant as *Glycine?* *Wilmsii*, but material so named was all incorporated under *T. oblongifolia*, and the name *G.?* *Wilmsii* became a synonym. Although Harms described this plant tentatively as a *Glycine*, he does not seem to have been quite satisfied that the genus was correct. The number of leaflets probably accounted for this doubt, although he cites examples of two species having more than three leaflets.

An examination of all the material placed under *T. oblongifolia* indicates that there are four distinct species.

The plant first described as *T. oblongifolia* occurs in Natal and extends to the Eastern Cape Province as far south as East London. It is readily recognised by its oblong leaves.

Two species occur in the Transvaal, one a robust trailing plant, more or less densely hairy in all parts, and with leaflets having a retuse apex with a recurved mucro: the other with shorter stems, and leaflets with a straight acute apex.

The fourth species occurs in Swaziland.

The differences in the leaves and other characters are, in the writer's opinion, sufficient reasons to remove this group of plants from both the genera *Tephrosia* and *Glycine*. With two or three exceptions, *Glycine* has 3-foliate leaves and, according to the material seen and to the descriptions of the various species, the leaves are distinctly long-petioled: the leaflets are generally of a membranous texture and stipellate. The group of plants under discussion all have subsessile leaves with leaflets almost coriaceous in texture and no stipellae.

There are also floral characters which differentiate this group from the two other genera. In *Tephrosia* and *Glycine* the vexillum is orbicular or suborbicular and may or may not be slightly auriculate. In these other plants the vexillum is "almost lyriiform," as Harms aptly describes it, and distinctly tailed. The carina and alae are narrow and oblong, and are also distinctly tailed.

The epithet *Ophrestia*, an anagram of *Tephrosia*, is chosen for the new genus.

Ophrestia H. M. Forbes gen. nov., herba, e basi ramosa; caules procumbentes vel adscendentes, leviter flexuosi, pubescentes; folia brevissime petiolata, 1-5 foliolata; stipulae lineares vel lineari-subulatae; foliola elliptico-oblonga vel ovato-oblonga vel oblongo-lanceolata, 5-7-nervata, nerviis subtus prominentibus. *Pedunculi* axillares, graciles vel robusti, pauci vel multi florum; flores purpurei; pedicelli breves; lobi calycis

tubo subaequilongi vel longiores, ovato-acuti vel lanceolato-acuminati; vexillum oblongum, superne dilatatum, fere orbiculatum, medio paullo constrictum, apice rotundatum vel emarginatum, basi auriculatum, extra pilosum; alae sub-oblancoolatae, auriculatae, extra pilosae; carina oblonga, auriculata, extra pilosa; stamina monadelpha, stamine vexillare ad medium liberum; ovarium pilosum, 2-4 ovulatum; stylus brevis, glaber vel breviter barbatus; stigma capitata. *Legumen* linearis, compressum, glabrescens.

Herb, branching from the base, stems ascending or procumbent, slightly flexuous, pubescent. *Leaves* subsessile, 1-5-jugate; stipules linear to linear-subulate; leaflets elliptic-oblong, ovate-oblong or lanceolate-oblong, apex obtuse, acute or retuse, mucronate, mucro sometimes recurved, nerves 5-7, prominent below, impressed above. *Peduncles* axillary, slender or robust, sometimes much exceeding the leaves, few to many-flowered. *Flowers* shortly pedicelled, petals mauve; calyx usually densely hirsute, lobes ovate to lanceolate-acuminate, equaling or longer than the tube; *vexillum* oblong, upper part dilated, almost orbicular, rotund or emarginate, slightly constricted in the middle, auriculate at base, pilose without; *alae* almost oblanceolate, base auriculate, pilose without; *carina* oblong, base auriculate, pilose without; *stamens* monadelphous, vexillary stamen free from the middle; *ovary* 2-4 ovulate, pilose; *style* short, glabrous or slightly hairy; *stigma* capitate; *legume* linear, compressed, becoming glabrous.

KEY TO SPECIES.

- Leaves obovate to cuneate-oblong, apex obtuse or retuse..... A.
 Leaves oblanceolate to lanceolate, apex acute..... B.
- | | |
|---|--------------------------|
| A. Mucro not recurved, apex obtuse..... | 1. <i>oblongifolia</i> . |
| Mucro recurved, apex retuse..... | 2. <i>retusa</i> . |
| B. Leaves lanceolate, up to 1.5 cm. broad, stipules linear-lanceolate | 3. <i>swazica</i> . |
| Leaves oblanceolate, up to 2 cm. broad, stipules narrow subulate-acuminate..... | 4. <i>nervosa</i> . |

1. *O. oblongifolia* (E. Mey.) H. M. Forbes, comb. nov.; *Tephrosia oblongifolia* E. Mey. Comm. Pl. Afr. Austr. 108 (1836); Hook. Sond. Journ. Bot. 2.86 (1843); Krauss in Fl. des Cap und Natalands 54 (1846); Harvey in Fl. Cap. 2.209 (1861-62); O. Kuntze Rev. Gen. Pl. 1.175 (1891); Wood Fl. Natal 42 (1907); Wood in Trans. S.A. Phil. Soc. 18.2.147 (1908); Burt Davy and Pott in Ann. Tvl. Mus. 3. 3.146 (1912); Bews Fl. Natal and Zululand 111 (1921); Burt Davy Fl. Tvaal. 1.2.377 (1932).

Glycine ? *Wilmsii* Harms in Engl. Jahrb. 26.302 (1899) in part.

Stems long and trailing, thinly pubescent. *Leaves* 1-5-jugate, subsessile, common petiole 2-7.5 cm. long; stipules linear, 3-6 mm. long; leaflets elliptic-oblong, entire, mucronate, glabrous above, pilose on the veins below, 2.5-7 cm. long, 0.9-2.5 cm. broad; petiolules short, densely pilose. *Peduncles* axillary, 6-32 cm. long. *Flowers* up to 1.2 cm. long, 2-4 together; pedicels about 1.2 mm. long. *Calyx* densely hairy; petals hairy without. *Style* glabrous or with a few hairs along one side. *Legume* 3.5-4 cm. long, 7-5 mm. broad. Seeds small, blackish.

Type specimen, *Drège* in Botanisches Museum, Berlin-Dahlem.

NATAL.—Inanda district: Inanda, Wood 402 (K., N., P., Z., B. H.); Pinetown district: Fields Hill, Wood 11072 (Z., P.); Ixopo district: Dumisa, *Rudatis* 1530 (K.); *Rudatis* 1792 (P.); Port Natal, *Krauss* 174 (K.); no definite locality, *Drège* (K., B., O., Pa., V., G.).

Var. *velutinosa* H. M. Forbes var. nov., a typo foliola utrinque velutinosa, pedunculis et calycibus velutinosus differt.

Type of the variety, *Gerrard* 1082, in Natal Herbarium.

NATAL.—Ixopo district: Dumisa, *Rudatis* 520 (P.); Izotsha, *Thode* (N.); no definite locality, *Gerrard* 1082 (K., N., V., Pa.).

The variety appears to be a slightly more robust plant and is much more pubescent in all parts than typical *O. oblongifolia*.

2. *O. retusa* H. M. Forbes, sp. nov., affinis *O. oblongifoliae* (E. Mey.), H. M. Forbes, sed foliolis apicibus retusis, mucrone reflexo differt.

Caules procumbentes, leviter flexuosi, pubescentes, usque ad 90 cm. longi. *Folia* breviter petiolata, 2-4-foliolata, 2-8 cm. longa; stipulae subulato-lanceolatae, 3-6 mm. longae; foliola cuneato-oblonga 2-4.5 cm. longa, 1-2 cm. lata, utrinque leviter pubescentia, apice mucronata, retusa, nerviis subtus prominentibus dense pubescentibus. *Pedunculi* usque ad 25 cm. longi, axillares, pubescentes. *Flores* 1.3 cm. longi; bractae setaceae, circiter 4 mm. longae; pedicelli circiter 1.5 mm. longi; bracteolae 3 mm. longae, setaceae. *Calycis* dentes tubo excedentes, dense pubescentes; vexillum 1.3 cm. longum, apice emarginatum; stylus 1.5 mm. longus, glaber.

Stems procumbent, up to 90 cm. long, slightly flexuous, pubescent. *Leaves* subsessile, 2-4-jugate, 2-8 cm. long; stipules subulate lanceolate, 3-6 mm. long; leaflets cuneate-oblong, 2-4.5 cm. long, 1-2 cm. broad, thinly pilose on both sides, apices retuse, mucronate, mucro recurved, nerves very prominent on the lower surface, veining reticulate, midrib and veins below more densely pilose. *Peduncles* up to 25 cm. long, axillary, pubescent. *Flowers* 1.3 cm. long, 2-4 together; bracts setaceous, about 4 mm. long; pedicels about 1.5 mm. long; bracteoles 3 mm. long, setaceous. *Calyx*-teeth longer than tube, densely pubescent; *vexillum* 1.3 cm. long, about 5 mm. broad at upper and widest part, emarginate, auriculate, pilose on outer surface; carina and alae slightly shorter than vexillum, about 2 mm. broad, auriculate, pilose on outer surface. *Ovary* 4 mm. long, densely pilose; style 1.5 mm. long, glabrous.

Type specimen, *Dyer* and *Verdoorn* 3405, in National Herbarium, Pretoria.

TRANSVAAL.—Lichtenburg district: Klipveld, *Liebenberg* 87 (P.); Grasfontein, *Sutton* 302 (P.); Pretoria district: Bryntirion, *Smith* 3353 (P.); Rietondale Pasture Research Stn., *Trapnell* 635 (K.); "The Willows," Pretoria, *Burt Dary* 2526 (B.H., P.); Koedoespoort, *Mogg* (P.); Daspoort, *Leendertz* 580 (Z., B.H.); Magaliesberg, *Dyer* and *Verdoorn* 3405 (P.); *Burke* 358 (K., Z.); Rustenburg district: Matlapansberge, *Rehmann* 5551 (K., Z.); Rustenburg, *Nation* 85 (K., B.H.); Vlakfontein, *Liebenberg* 138 (P., G.).

3. *O. swazica* H. M. Forbes sp. nov., affinis *O. retusae* H. M. Forbes, sed foliolis lanceolatis apicibus acutis differt.

Caules graciles, leviter pilosi, ascendentes vel procumbentes, usque ad 48 cm. longi. *Folia* breviter petiolata, 1-3-jugata: petioli 0.5-2.7 cm. longi; stipulae lineares, 2-6 mm. longae; foliola lanceolata, mucronulata, 2.5-8 cm. longa, 0.6-1.5 cm. lata, mucrone circiter 1 mm. longa, supra glabra, subtus nerviis parce pilosis. *Pedunculi* axillares, usque ad 9 cm. longi; bractae setaceae, 3 mm. longae; pedicelli circiter 3 mm. longi; bracteolae setaceae, circiter 1.5 mm. longae. *Flores* 1.5 cm. longae; dentes calycis tubo excedentes; stylus 1.5 mm. longus, glaber vel parce pilosus.

Stems slender, thinly pilose, ascending or procumbent, up to 48 cm. long. *Leaves*; shortly petiolate, 1-3-jugate, petiole 0.5-2.7 cm. long; stipules linear, 2-6 mm. long; leaflets lanceolate, 2.5-8 cm. long, 0.6-1.5 cm. broad, mucronate, glabrous above, thinly pilose on the veins below. *Peduncles* axillary, up to 9 cm. long, few flowered near the apex; bracts setaceous, 3 mm. long; pedicel about 3 mm. long. *Calyx*-lobes lanceolate, longer than the tube, tube 3 mm. long, lobes 6 mm. long; *vexillum* 1.5 mm. long, glabrous or with a few hairs along one side. *Mature legumes* not seen.

Type specimen, *Bolus* 11845, in National Herbarium, Pretoria.

SWAZILAND.—In collibus, in terra "High Veld" dicta inter Dalriach et Forbes' Reef *Bolus* 11845 (P., K., A.M., B.H.).

4. *O. nervosa* H. M. Forbes sp. nov., affinis *O. swazicae* H. M. Forbes, sed foliolis oblanceolatis subtus nervis valde prominentibus differt.

Caules procumbentes, leviter flexuosi, pubescentes. *Folia* 1-3-jugata, 1-4 cm. longa; stipulae angusto-subulatae vel lineares, 4-7 mm. longae; foliola oblanceolata, apice acuta, mucronata, nervis subtus valde prominentibus, utrinque parce pilosa, 2.8-5.5 cm. longa, 1.7-2 cm. lata. *Pedunculi* axillares, 5-13 cm. longi; bractae setaceae, 2 mm. longae; pedicelli 1.5 mm. longi; bracteolae setaceae, 3 mm. longae. *Flores* 1.1 cm. longi; vexillum 1.1 cm. longum, apicem versus 4 mm. latum. *Ovarium* pilosum; stylus 1.5 mm. longus, glaber.

Stems procumbent, slightly flexuous, pubescent. *Leaves* 1-3-jugate, common petiole 1-4 cm. long; stipules narrow-subulate to linear, 4-7 mm. long; leaflets oblanceolate, apex acute, mucronate, nerves very prominent on lower surface, thinly pilose on both sides, 2.8-5.5 cm. long, 1.7-2 cm. broad. *Peduncles* axillary, 5-13 cm. long; bracts setaceous, 2 mm. long; pedicels 1.5 mm. long; bracteoles setaceous, 3 mm. long. *Flowers* 1.1 cm. long. *Vexillum* 1.1 cm. long, 4 mm. broad towards the apex; alae and carina 2 mm. broad, alae slightly shorter than carina. *Ovary* pilose, 4 mm. long; style 1.5 mm. long, glabrous. *Legume* up to 3.5 cm. long and 0.8 cm. broad, shortly pubescent.

Type specimen, *Thode* A 1394 in Natal Herbarium, Durban.

TRANSVAAL.—Marico district: Zeerust, *Thode* A 1394 (N., P.); Lydenburg district: Lydenburg, *Wilms* 383 (K., B.); Lydenburg, *Schlechter* 3962 (Z., B.H.); no definite locality "Bushveld," *Rehmann* 5186 (Z.); *Zeyher* 520 (K.).

A NEW SPECIES OF FICUS FROM THE BORDERS OF MOCAMBIQUE AND NYASALAND.

By A. J. W. Hornby.

Ficus kiloneura A. J. W. Hornby sp. nov., affinis *F. populifoliae* Vahl, sed receptaculis majoribus non reticulatis cortice cinereo (non luteo) differt.

Arbor magna circa 15m. alta, multo ramosa; ramuli cortice cinereo glabro obtecti. *Stipulae* glabrae, lanceolatae, 1 cm. longae, caducae. *Folia* late ovata, breviter acuminata, basi late cordata vel rotundata, 9–18 cm. longa, 7–11 cm. lata, chartacea, glabra; costa media supra impressa vel pro parte prominens, subtus prominens apice extenuata; nervi laterales utrinsecus circa 15, utrinque prominentes, angulo 70° abeuntes, pellucidi, paralleli, marginem versus conjuncti; veni numerosi utrinque prominentes, reticulati; margines integri, incrassati; petioli 4.5–10 cm. longi, glabri, sulcati. *Receptacula* axillaria, pedunculata, oblongo-globosa, 1.5–2 cm. diametro, glabra, aureo-lepidota, umbonata; ostiolum bilabiatum bracteis omnibus in receptacula descendentibus; pedunculi 1.8 cm. longi. *Bractee* basales rudimentalae.

N. MOCAMBIQUE.—Province do Niassa, *Hornby* 2471 in National Herbarium, Pretoria (type); 2581; 2571.

Large trees up to 15 metres, much branched, flat crowned. Trunk buttressed by anastomosing growths, aerial roots present. Profuse exudation of milky juice on wounding, which is used as bird lime. Branches numerous, grey, irregularly ribbed and cracked. Bark on trunk irregularly cracking, or widely reticulate: on branches smooth and grey with vertical and horizontal cracks. Assimilating green tissue lightly covered with thin bark on younger trees. *Stipules* about 1 cm. long, lanceolate, glabrous, caducous; petiole 4.5–10 cm. long, slender, glabrous, channelled; leaf margin decurrent on upper side of petiole. *Leaf-blade* broadly ovate, 9–18 cm. long, 7–11 cm. broad, chartaceous, glabrous and dull on both sides; midrib depressed or partly prominent above, prominent below, continued to apex; lateral veins about 15 pairs, spreading from the main vein at about 70°, prominent above and below, looping prominently near the margin, pellucid, lowest three main lateral veins arising from cordate base and curving upwards, the rest straight, parallel, net veins very numerous, close and slender, forming prominent reticulation above and below; margin entire, thickened; apex acute to shortly acuminate, acumen about 8 mm. long; base widely cordate or rounded. *Receptacles*, axillary in pairs, pedunculate, oblong-globose, not over 2.0 cm., usually 1.5 cm. diameter, glabrous, golden-lepidote, umbonate, osteole pore-like, bracteoles descending into fig; basal bracts, rudimentary at apex of peduncle; peduncle up to 1.8 cm. long.

OCCURRENCE.—Type specimens found 100 yards south of Nyasaland Police and Customs Post at Chiponde fork roads west of frontier between Provincia do Niassa, Mocambique and Nyasaland.

This species of *Ficus* also occurs as single large trees in the south-western zone of the Province of Niassa near the frontier of Nyasaland at an altitude of about 750 metres and where the average annual rainfall is about 900 mm. They are found both in *Brachystegia* associations on fertile sandy loams under dominant *B. spicaeformis*, and in open woodland on deep brown loams associated with large *Ostryderris stuhlmannii*, *Pseudolachnostylis maprouneifolia*, and smaller trees of *Voacanga lutescens*, *Vitex buchananii*, *Schrebera* sp., *Strychnos spinosa*, *Bauhinia petersiana*, *Ficus stuhlmannii*.

There is extensive shrub growth in these open woodlands consisting of *Cassia petersiana*, *Cassia absus*, *Crotalaria intermedia*, *C. comosa*, *C. natalitia*, *Byrsocarpus tomentosus*, *Temnocalyx obovatus*, *Clerodendrum triplinerve* with medium high species of *Hyparrhenia*, *Cymbopogon*, *Brachiaria*, etc.

The zone in which this species of *Ficus* occurs is regarded as one of the best for cultivation of flue-cured tobacco.

I should like here to add my acknowledgement and thanks to the Division of Botany and Plant Pathology, Pretoria, for assistance in determinations of specimens during my ecological work in the sub-tropical region of S.E. Africa.

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